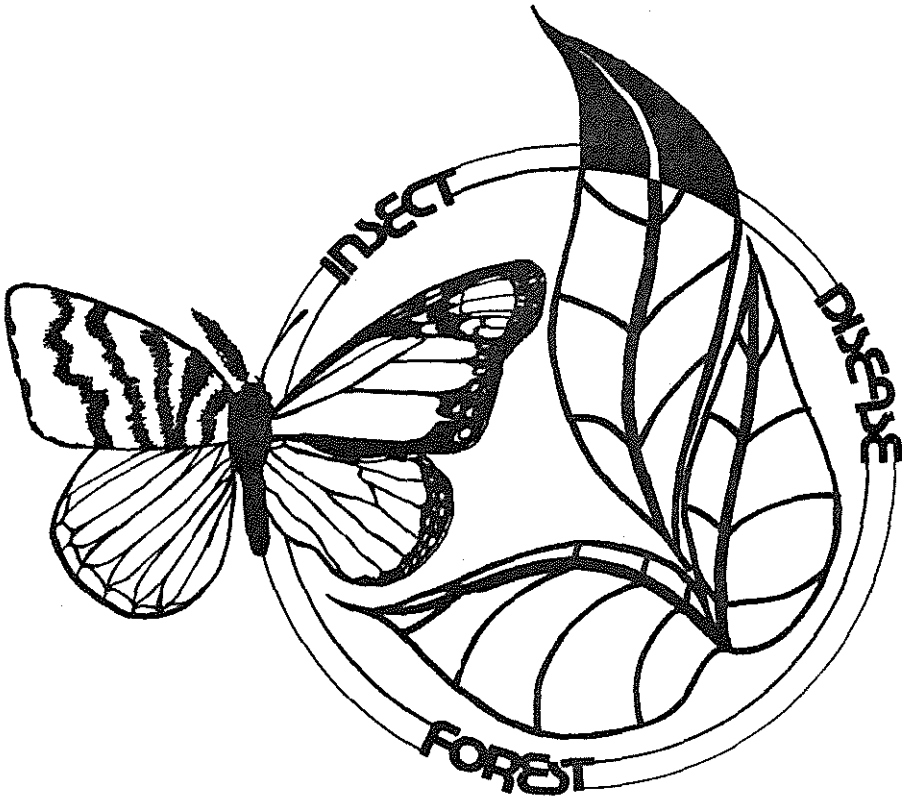
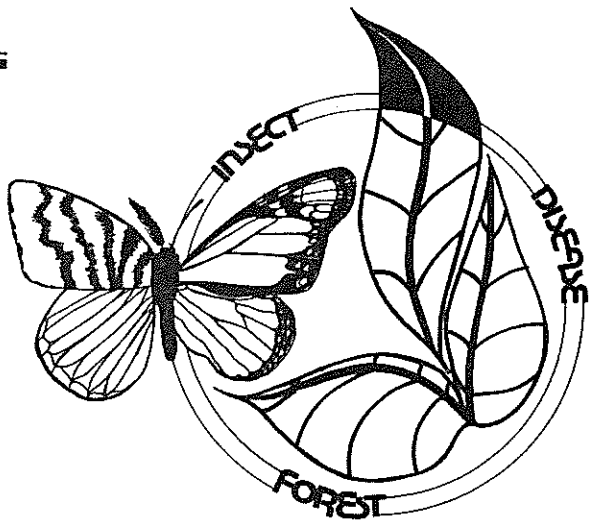
MISSOURI FOREST PEST REPORT 1980



FORESTRY DIVISION
MISSOURI DEPARTMENT OF CONSERVATION

MISSOURI FOREST PEST REPORT



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INSECTS OBSERVED IN 1980

1. Asiatic Oak Weevil, Cyrtepistomus castaneus, (Roelofs)
2. Black Turpentine Beetle, Dendroctonus terebrans, (Oliv.)
3. Bronze Birch Borer, Agrilus anxius, (Gory)
4. Carpenterworm, Prionoxystus robiniae, (Peck)
5. Cottonwood Borer, Plectrodera scalator, (F.)
6. Cottonwood Leaf Beetle, Chrysomela scripta, (F.)
7. Cottonwood Twig Borer, Gypsonoma haimbachiana, (Kft.)
8. Eastern Tent Caterpillar, Malacosoma americanum, (F.)
9. European Pine Sawfly, Neodiprion sertifer, (Geoff.)
10. Evergreen Bagworm, Thyridopteryx ephemeraeformis (Haw.)
11. Fall Webworm, Hyphantria cunae, (Drury)
12. Gypsy Moth, Porthetria dispar, (L.)
13. Loblolly Pine Sawfly, Neodiprion taedae linearis (Ross.)

13a. Looper Complex

14. Nantucket Pine Tip Moth, Rhyacionia frustrana, (Comst.)
15. Pales Weevil, Hylobius pales, (Hbst.)
16. Poplar Tent Maker, Ichthyura inclusa, (Hbn.)
17. Red Oak Borer, Enapholodes rufulus, (Haldeman)
18. Redheaded Pine Sawfly, Neodiprion leconte, (Fitch)
19. True Tree Grasshopper, Dendrotettix quercus, (Pack)
20. Two-lined Chestnut Borer, Agrilus bilineatus, (Web.)
21. Walnut Caterpillar, Datana integerrima, (G.& R.)

INSECTS OBSERVED IN 1980 BUT NOT DISCUSSED IN REPORT

Harmful or Damaging Insects

1. Carpenter Bee, Xylocopa virginica virginica (L.)
2. Green-striped Fruit worm, Grapholitha antennata (Wlk.)
3. Hag Moth, Phobetron pithecium, (J. E. Smith)
4. Locust Leaf Miner, Xenochalepus dorsalis (Thunberg)
5. Mourning Cloak Butterfly, Nymphalis antiopa (L.)
6. Oak Twig Girdler, Oncideres cingulata, (Say)
7. Obscure Scale, Melanaspis obscura, (Comstock)
8. Periodical Cicada, Magicicada septendecim
9. Pine Needle Scale, Phenacaspis pinifoliae, (Fitch)
10. Tulip Tree Scale, Toumeyella liriodendri, (Gmelin)
11. White Pine Bark Aphid, Pineus strobi, (Htg.)
12. Walking Stick, Diapheromera femorata, (Say)

Beneficial or Aesthetic Insects

1. Ant lion, Dendroleon obsoletum, (Say)
2. Bald-faced hornet, Vespula maculata, (Linn.)
3. Caterpillar Hunter, Calosoma scrutator
4. Cicada Killer, Sphecius speciosus, (Drury)
5. Monarch Butterfly, Danaus plexippus, (L.)
6. Preying Mantis, Stagmomantis carolina, (Johanssen)
7. Wheel Bug, Arilus cristatus, (Linn.)

DISEASES OBSERVED IN 1980 AND DISCUSSED IN REPORT

1. Diplodia Tip Blight, Diplodia pinea (Desm.) Kickx.
2. Dutch Elm Disease, Ceratocystis ulmi (Buism.) C. Moreau
3. Oak Wilt, Ceratocystis fagacearum (Bretz) Hunt
4. Pine Wilt Disease, Bursaphelenchus lignicolus M. & K.
5. Rhizosphaera Needlecast, Rhizosphaera kalkhoffii Bub.
6. Sycamore Anthracnose, Gnomonia platani Edg.

DISEASES OBSERVED IN 1980 AND NOT DISCUSSED IN REPORT

1. Armillariella Root Rot, Armillariella mellea (Vahl ex Fr.) Karst. (formerly Armillaria mellea (Vahl. ex Fr.) Quél.)
2. Ash decline, unknown
3. Ash anthracnose, Gloeosporium aridum Ell. & Holw.
4. Bacterial Wetwood, Erwinia nimipressuralis (Burr.) Winsl.
5. Black Knot of Plum, Dibotryon morbosum (Schw.) Th. & Syd.
6. Bleeding Canker, Phytophthora cactorum (Leb. & Cohn) Schr.
7. Brown Spot Needle Blight, Scirrhia acicola (Dearn.) Sigg.
8. Butternut Decline, Sirococcus clavigignenti-juglandacearum sp. nov.
9. Cedar-Apple Rust, Gymnosporangium juniperi-virginianae Schw.
10. Chestnut Blight, Endothia parasitica (Murr.) P.J. & H.W. And.
11. Crown Canker of Dogwood, Phytophthora cactorum (Leb. & Cohn) Schr.
12. Cytospora Canker of Spruce, Cytospora kunzei Sacc.
13. Cytospora Canker of Willow, Cytospora nivea (Hoff.) Fr.

14. Dothistroma Needle Blight, Dothistroma pini Hulb.

15. Eastern Gall Rust, Cronartium quercuum (Berk.) Miy. ex Shirai

16. Elm Phloem Necrosis, mycoplasma

17. Fire Blight, Erwinia amylovora (Burr.)

18. Fomes Root and Butt Rot, Heterobasidion annosum (Fries) Berf. (formerly Fomes annosus (Fr.) Cke.)

19. Lombardy Poplar Leaf and Twig Blight, Didymosphaeria populina Vuill.

20. Lophodermium Needle Cast, Lophodermium pinastri (Schrad. ex Hook.) Chev.

21. Maple Anthracnose, Gleosporium apocryptum E. & E.

22. Maple Decline, unknown

23. Pecan Bunch Disease, mycoplasma

24. Naemacyclus Needlecast, Naemacyclus niveus (Pers. ex Fr.) Sacc.

25. Nectria Canker, Nectria galligena Bres.

26. Needle Rust, Coleosporium asterum (Diet.) Syd.

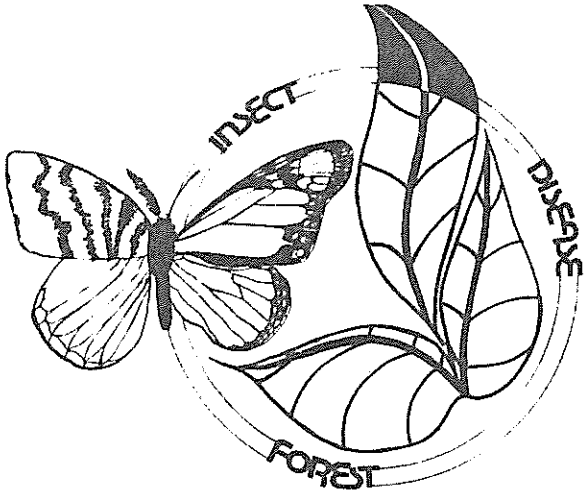
27. Oak Anthracnose, Gnomonia quercina Kleb.

28. Oak Leaf Blister, Taphrina caerulescens (Mont. & Desm.) Tul.

29. Phomopsis Blight, Phomopsis juniperovora Hahn

30. Pin Oak Chorosis, iron deficiency

31. Verticillium Wilt, Verticillium dahliae Kleb.



STATUS REPORT

FORESTRY DIVISION

INTRODUCTION

As we sit back and perhaps prop our feet on the wood stove in our favorite room, we can only take joy in the cool or cold temperatures that prevail. It is difficult to comprehend that only a few months ago we and all other living animals and plants were subjected to such high searing temperatures and drought conditions, that were compared to conditions in the 1930's and in the early 1950's.

This year, 1980, will be entered on the permanent records in books of the great drought and prolonged temperatures over 100° F. There are other methods of recording and tracing this summer. Observe the dead trees and on the live healthy ones if they were sampled, compare the width of the annual ring produced in 1980 as compared to previous years.

In keeping with the theme of our previous eighteen annual Forest Pest Reports, we attempt here to include pests that have caused aesthetic damage to urban or forest trees. We will report pests that are a potential problem, endangered the quality of vegetation appearance, or caused log degrade and lumber value loss.

As more of you learn of our Pest Management Program we are able to know what your problems are and how best to service your requests. Because of the highly specific nature of the Program, more of you require answers to a great variety of questions on drought damage, diseases, insects, spiders, and mushrooms.

Missouri will be going into 1981 with a deficit of moisture ranging from 8 to 12 inches. This amount of rain, of course, can never be recovered. We will hope for at least normal precipitation in 1981. All plants suffered in 1980 from the lack of moisture and also the searing high temperatures. What appeared to live through this summer, may live or die next year. This will depend on how early the plant began to suffer from the drought in 1980. Then there is the in-between tree that might show decline symptoms for the next three or four years and then die.

There were a number of pest problems in Missouri in 1980 that were very conspicuous requiring a good amount of our foresters' time. The major problems were the looper complex defoliation in central Missouri to the St. Louis area, and the variable oak leaf caterpillar, so abundant in 1969-71, in west and central Missouri. A relatively newly identified, but old problem, is that of the pine wilt nematode which is taking out ornamental Scotch pine trees by the hundreds.

Gypsy moth males were found in traps this summer in Missouri.

Disease problems on all shrub and tree species were accentuated by the predisposing drought. Although some diseases developed because of the drought, others did not because of the absence of wet conditions causing the spread of spores.

The Program

In 1962, a cooperative program, the Forest Pest Control Program, was entered into with the U.S. Forest Service by the Forestry Division, Missouri Department of Conservation. Under the original agreement this effort is designed to detect, evaluate or appraise, and control forest insects and diseases on state and private land. Department Foresters and other personnel report occurrences of damaging insects, diseases and wild animals. Forestry Pest Management specialists coordinate the program.

Damage to shrubs and trees by drought, insects, diseases, and other agents is often insidious but is real. This damage is often unnoticed until the tree or shrubs dies. Tree losses on an annual basis are great due to hardwood borers, pine cambial feeders, defoliating insects, drought, vascular diseases and root rot.

As with our frail, mortal bodies, trees suffer under stress in one form or another. Some of these stresses could be drought, lack of minerals, shallow soil, inadequate oxygen in the soil, or a soil that is too wet. Maintaining tree vigor is the key to growing a tree free of problems.

Dr. Patricia Gowen, Forest Pathologist, joined our staff in September of 1980. Pat is from New York and brings to us a wealth of knowledge, personality and enthusiasm. We welcome her to our conservation family and to Missouri.

Conditions In Brief

Spring of 1980 was generally rather dry. Winter of 1979-80 was mild compared to the previous winter. Temperatures began in the 90's in early June and lasted in record breaking temperatures through September. Moisture was lacking throughout the spring, summer and fall. Statewide fruit production was spotty in certain areas and also on each species. Walnut was very spotty and light. Hickory was very light while persimmon was moderate to heavy. Turkey and deer may have slim pickings on the acorn crop from this fall.

The pine wilt nematode continued to receive much attention as did a number of other foliage diseases of spruce and pine. The looper complex captured our attention during spring in the central and east central part of Missouri. We raised our eyebrows once again at learning about the resurrection of the variable oak leaf caterpillar in central and southwest Missouri. The bronze birch borer continues to be responsible for the demise of many white birch over the state, and the gypsy moth was trapped in the St. Louis area.

All pests in this report have been observed by our Department Foresters, other Department personnel, Ramon D. Gass, Forest Insect and Disease Specialist, or Dr. Patricia Gowen, Forest Pathologist.

* * * * * *

Gypsy Moth - Three male moths were trapped in separate traps in St. Louis County and Montgomery County. Personnel from the State Department of Agriculture, U.S.D.A., A.P.H.I.S., and Missouri Department of Conservation, located and monitored over 2,000 gypsy moth traps over the state. Other cooperators included Ray Bruns with Union Electric Company in St. Louis, and John Grinstead at Fort Leonard Wood.

Variable Oak Leaf Caterpillar - Defoliated thousands of acres in ten counties in central and southwest Missouri.

Asiatic Oak Weevil - Infested hardwood forests in south Missouri causing defoliation ranging from two to five percent of leaf surface.

Looper Complex - Caused heavy defoliation in central and east central Missouri during late spring. Much of the defoliation amounted to 100 percent of the crown.

True Tree Grasshopper - Continued to cause light to moderate defoliation in Iron, Madison, Reynolds and Texas Counties.

Eastern Tent Caterpillar - Was moderate to heavy where eastern black cherry grows. There were numerous webs on each tree infested.

Fall Webworm - Was reported from many counties in 1980, however, the occurrence was light. Either the population was affected by parasitism or the summer temperatures cooked the egg masses prior to hatching.

Nantucket Pine Tip Moth - Was light this year being reported from seven counties.

European Pine Sawfly - Populations increased in 1980 and were discovered in 18 counties. Moderate to heavy defoliation occurred on Scotch pine in various Christmas Tree Plantations.

Loblolly and Redheaded Pine Sawflies - Were discovered in low numbers in a number of counties.

The Evergreen Bagworm - Occurred statewide, but is more noticeable in urban areas on evergreen ornamental plants. Defoliation was light to moderate.

Cedar-Apple Rust - Was widespread but not serious in 1980.

Diplodia Tip Blight - Appeared to be heavy and widespread on Austrian pine. Some damage was also observed on Eastern white pine.

Dothistroma Needle Blight - Was a problem on ornamental Austrian pine.

Dutch Elm Disease - Continued to be a serious and widespread problem, causing economic loss in urban areas.

Fire Blight - Was not a significant problem in 1980 because of dry spring and summer weather.

Maple Decline - This disease appears to be increasing in severity in urban areas.

Oak Wilt - In addition to the 46 counties confirmed to have oak wilt, 11 counties reported the occurrence of oak wilt for the first time in 1980. Seven of these counties are located north of the Missouri River.

Phomopsis Blight - Appears to be a widespread and persistent problem on red cedar and other junipers.

Pine Wilt Disease - Was confirmed in 16 counties in 1980. This nematode disease has been very destructive to ornamental and plantation grown Scotch pine.

Rhizosphaera Needlecast - Is a continuing problem on ornamental blue spruce and an occasional problem on white spruce.

Sycamore Anthracnose - Was a serious and widespread leaf and twig problem in 1980. Many trees have been weakened or killed by repeated defoliations and branch dieback.

Projects

Any program cannot be coordinated smoothly without the cooperation of all those involved. Thus, the enthusiastic team effort of the Forestry Division staff specialists and Department foresters resulted in a well coordinated, successful program again during 1980. Over 1,800 forest and shade tree requests were serviced statewide in 1980. As always, staff specialists were available to all who sought their assistance. In May and early June, eight regional Pest Management Clinics were held for all Department and personnel from other forestry related agencies. A total of 95 people attended these clinics. These were one-day meetings and were well received by all participants. Staff specialists serviced over 1,000 pest-related telephone calls. Over 700 diagnoses were made for the state. Periodic visits to various Natural Areas, seed production areas or to the George O. White State Forest Nursery revealed no serious pest problems.

Gass and Gowen conducted detection and evaluation surveys on the major insect and disease problems in 1980, on 7,003,100 acres. Reports were prepared and submitted to the U.S. Forest Service.

The pine wilt nematode problem continued to grow at an alarming rate during 1980, possibly because of the drought.

A total of seven Forest Insect and Disease Status Reports (March through September) were prepared and sent to all Missouri Christmas Tree Producers, most Department personnel and other individuals, totaling 800 copies per month.

Hardwood Defoliators and Borers

Gypsy Moth - During this summer, single male moths were trapped in three single locations. One was discovered in a trap in St. Louis at the junction of Brentwood and Clayton. Another was found at the junctions of 100 and 109 north of Rockwood Reservation.

The third was found in a private campground in Montgomery County near I-70. Gypsy moth egg masses were discovered on a camper trailer by a owner in north St. Louis. Defoliation by the gypsy moth was on the upswing during 1980, with more than 5 million acres being defoliated in notheast United States.

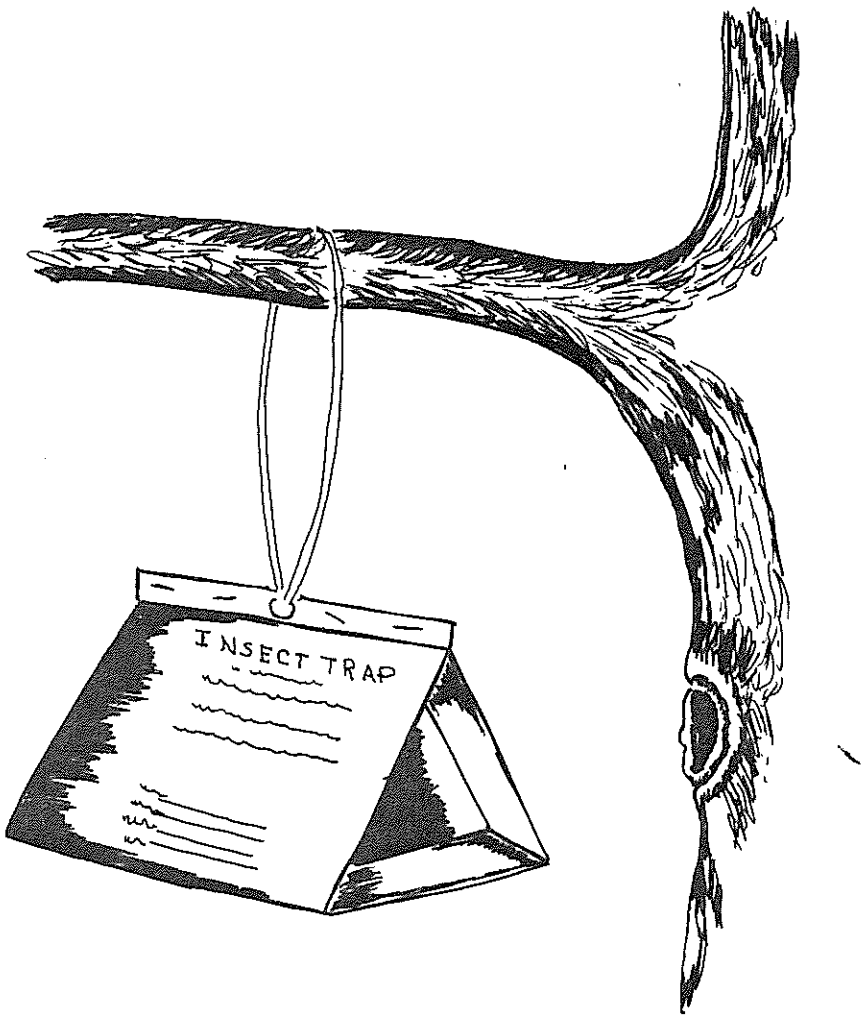


Figure 1: Gypsy Moth Trap

GYPSY MOTH
a
b
c
d
e
f
g
h
i
k
l
Close-up of a, ovipositing female; b, male; c, female pupa; d, male pupa; e, old egg mass. Larvae on oak leaf: f, First instar; g, second instar; h, fourth instar; i, sixth instar, or mature larva. Egg masses, k, under branches and on rock; l, young larvae spinning down. (a to i, about natural size; k and l, reduced.)

Figure 2: Life Stages of the Gypsy Moth

The life cycle of the gypsy moth parallels that of a number of other insects. The gypsy moth is not native to the United States. Larvae feed on a great variety of hardwood foliage in spring and early summer. With three repeated defoliations, hardwood trees can die. One defoliation can kill evergreen trees.

Gypsy moths overwinter in the egg stage in masses on bark, rocks, litter or on man-made objects.

BN-33676

Egg masses on tree.

Figure 3: Gypsy Moth Egg Masses

Variable Oak Leaf Caterpillar - Was detected in central and southwest Missouri where defoliation occurred from light to heavy intensity. We are experiencing, perhaps, a repeat of 1969, where populations began to build. If this trend continues, we can expect to see populations build in 1981, and then collapse in 1982 or 1983. Infestations were reported in Camden, Morgan, Miller, Henry, Barton, Jasper, Newton, McDonald, Lawrence, and Barry Counties, with heavy defoliation (100 percent) being reported from Miller, Newton and McDonald Counties.

The Looper Complex - Problem of 1979, expanded and intensified in 1980. The main area of defoliation of many species of hardwood trees was from central to east central and southeast Missouri. Defoliation ranged from light to heavy. This activity created considerable attention from the public and as a result generated hundreds of telephone calls to our District Forestry offices.

Populations of the large green beetles were noted in association with the loopers. The Calosoma scrutator (Fabricius), or Caterpillar hunters, were observed feeding readily upon looper larvae.

Some of the specific insects contributing to the overall defoliation were the elm spanworm, spring cankerworm, Linden looper, and oak leaf rollers and tiers.

Trend - Populations in 1981 are expected to compare to 1980 activity.

Suppression - No control was conducted on a forest wide scale.

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Eastern Tent Caterpillar - Occurred on black cherry trees in heavy amounts during spring, 1980. Webs ranged from one to as many as six on many trees. Coupled with the drought, this defoliation was responsible for minor mortality of affected trees.

Trend - Webbing and defoliation should be lighter in 1981, since many insects were not able to complete their feeding due to lack of foliage because of the great demand for the leaves. Likewise, summer temperatures were so high that adults could have died prior to mating or egg masses could have "cooked" on the twigs.

Suppression - Shade tree owners removed webs from trees in some areas of the state.

* * * * * *

The Fall Webworm - Was present this year in various parts of south Missouri, but there again, high temperatures were responsible for mortality of the adults and "cooked" egg masses. Where populations were found, they were light. Defoliation typically occurs on sycamore, walnut, hickory, persimmon and several other species.

Trend - Moderate webbing could occur in 1981.

Suppression - Individual colony control was conducted by owners of shade tree and nut orchards.

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Walnut Caterpillar - Populations were light to moderate in scattered counties in 1980. This is a native insect, is with us every year, and should be controlled on nut orchard and shade trees if deemed necessary according to degree of infestation.

Trend - In 1981, populations should be slightly smaller than in 1980.

Suppression - Few plantation and orchard owners sprayed their trees for this insect.

* * * * * *

True Tree Grasshopper - Continued to defoliate white oaks in Iron, Madison, Reynolds and Texas Counties. Damage was light to medium in scattered areas. No mortality is anticipated as a direct result of the defoliation.

Trend - Populations will continue in this area with a slight increase in degree of defoliation in 1981.

Suppression - No suppression work was carried out for this insect.

* * * * * *

Asiatic Oak Weevil - Was widespread and very abundant in Missouri in 1980. Defoliation ranged from between five and twenty percent on forest and shade trees alike. No mortality has resulted from defoliation.

Trend - Populations will continue in 1981, comparable to 1980.

Suppression - There is no practical control for the beetle under forest conditions.

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The Carpenterworm, Red Oak Borer - and other living tree hardwood borers continue to infest hardwood trees in forested areas of the state.

Trend - Infestation will continue to occur in trees on poor sites. Estimated dollar loss to hardwood borer degrade amounts to over $1,000,000.00 annually. Hardwood borers are probably the major insect pest on shade trees in the Urban Community.

Suppression - Stand conversion, selective tree harvest, and sanitation harvest was conducted in various timber sales over the state. Some shade tree owners controlled borers in high value trees on a limited basis.

* * * * * *

The Bronze Birch Borer - Once again this year, continued to infest many European white birch yard trees over the state. Infestation was heavy in central Missouri causing decline and mortality of weakened trees. Plants are usually weakened due to moisture deficits.

The Bronze Birch Borer is traditionally a secondary attacker, infesting weakened white birch.

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The Two-Lined Chestnut Borer - A cousin to the Bronze Birch Borer, typically attacks weakened oak in south Missouri where moisture stress is a problem. In 1980, drought was one of the limiting factors that triggered attacks by the Two-Lined Chestnut Borer coupled with late frost damage and droughty sites.

Trend - Both the Bronze Birch Borer and Two-Lined Chestnut Borer will continue to kill birch and oaks during and several years following our present drought cycle.

Suppression - In the forest is feasible only by special stand manipulation. Drought hazard sites should be recognized and treated with special management techniques. These may consist of clear cutting and allowing the same species to return. On some areas it might be more economical to convert from oak to shortleaf pine within the natural pine range.

The selection system could be used to reduce basal area, favoring the more drought tolerant species using a shorter rotation. It may be desirable to grow a normal basal area volume per acre and use the entomological and pathological rotation.

* * * * * *

The Cottonwood Twig Borer, Cottonwood Borer, Cottonwood Leaf Beetle and Poplar Tent Maker - Continue to infest cottonwood where it grows. Borer damage is greater on trees growing on poor sites. Defoliation by the poplar tent maker occurs almost everywhere on cottonwood.

Trend - No increase in infestation is anticipated in 1980.

Suppression - No control was conducted for any of these pests in 1980.

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Pine Trunk Borers, Twig Borers and Terminal Feeders

Nantucket Pine Tip Moth - and related species were very light in 1980. Scattered shortleaf pine plantings out of the natural range were moderately infested by third generation tip moth.

Trend - Populations are expected to be low to moderate in 1981.

Suppression - No feasible chemical controls are available to plantation owners.

Black Turpentine Beetle - Infested shortleaf pine in a number of counties this year. Lightning-struck trees attracted beetles in several cases. Only single trees were infested over the botanical range of shortleaf pine. Infestation was at an endemic level in 1980.

Trend - Light infestations are anticipated where shortleaf pine have been disturbed or are in a weakened condition.

Suppression - Where infestations occurred, recommendations were made to fell trees and either salvage or burn.

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Pales Weevil - Infested Scotch pine Christmas trees in seven counties in 1980. Damage was not severe, but nevertheless, present and alarming to growers. Some flagging occurred, however, all trees could be salvaged for another year or for use in 1980.

Trend - Pales weevil will continue to infest scattered plantations where cultural and chemical controls are not used.

Suppression - Christmas tree producers continue to treat their stumps with various chemicals to discourage egg laying.

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Pine and Cedar Defoliators

European Pine Sawfly - Infested Scotch pine in plantations and on ornamentals in twenty counties in 1980. Infestations ranged from light to heavy causing substantial defoliation which required treatment.

Trend - Populations will increase slightly in 1981 over 1980.

Suppression - Christmas tree plantation owners with larger plantations and the problem, spray for this insect.

* * * * * *

The Loblolly Pine Sawfly - Was reported from four counties in south Missouri this year. Defoliation was light and the insect was not a serious problem.

Trend - Populations will increase slightly in 1981.

Suppression - No control work was conducted during 1980.

Redheaded Pine Sawfly - Was present in three counties on shortleaf pine in south Missouri. Defoliation was moderate in pine plantations.

Trend - Populations could increase slightly in 1981.

Suppression - Only limited control work was accomplished on plantings around Department tower sites.

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Evergreen Bagworm - Populations were moderate to high on pfitzer evergreens and other susceptible evergreens around the state.

Trend - Moderate to heavy infestations of ornamental evergreens will continue in 1981.

Suppression - Many ornamental owners had their evergreens sprayed on a contract basis by private firms and others handpicked the bags.

* * * * * *

Forest and Ornamental Tree Diseases

Diplodia Tip Blight - This problem was severe and widespread on older Austrian pines (30 years old and older) in 1980.

Trend - Future rates of infection will depend on the amount of spring moisture and the amount of inoculum available for infection.

Suppression - Control of the disease is achieved by spraying trees twice in the spring with a registered fungicide such as Bordeaux mixture, once at bud break (from the middle to the end of April) and again two weeks after bud break.

* * * * * *

Dutch Elm Disease - Continues to be a serious problem of American elm wherever it is growing. Death of elms in urban areas continued to create great economic loss.

Trend - Due to the high level of inoculum, the disease will continue to be a problem in 1981.

Suppression - Sanitation should continue to be the major control method employed in Missouri. Chemical injection work used for individual high-value elms is not a practical control procedure for large numbers of elms.

Oak Wilt - Was reported in 57 counties during the growing season of 1980. Most of the counties reporting oak wilt for the first time were north of the Missouri River. The disease has destroyed oaks in urban settings resulting in economic loss, but has not caused heavy volume or economic loss in the forests.

Trend - Oak wilt is endemic in the state. It does not appear to be a serious problem for Missouri's hardwood forests, though it is of economic importance in urban areas.

Suppression - At the present time, sanitation is the most effective and practical control procedure.

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Pine Wilt Disease - This long-horned beetle vectored disease caused by the nematode Bursaphelenchus lignicolus was confirmed in 16 Missouri counties in 1980. The nematode has been found to afflict Eastern white pine, Austrian pine, and Scotch pine in the state.

Trend - The disease appears to be endemic in Missouri. Disease intensity will depend on weather conditions (drought conditions are believed to favor disease increase) and the number of beetle vectors.

Suppression - Sanitation, the removal of diseased and dead trees is the most effective and practical means of control.

* * * * * *

Rhizosphaera Needlecast - Was reported in 8 counties in 1980, but is probably widespread in the state. The disease is a serious problem of ornamental blue spruce.

Trend - Rhizosphaera needlecast appears to be endemic in Missouri. It will be a problem wherever blue spruce is planted.

Suppression - Good control can be achieved by spraying trees twice with Bordeaux mixture, once in early June and again in early July. Treatment of infected trees should be continued for several years.

* * * * * *

Sycamore Anthracnose - This disease was widespread and heavy in 1980. Many urban and forest trees were afflicted with dieback and defoliation resulting in their decline and death.

Trend - The disease has been severe during 1978, 1979, and 1980, creating an enormous reservoir of inoculum for infection in the spring of 1981. Unless weather conditions are unfavorable (cool, dry spring) another heavy outbreak of the disease can be expected during 1981.

Suppression - Control of sycamore anthracnose in the forest is not practical. Homeowners can control the disease on ornamental sycamore by spraying trees three times in the spring with fungicide (Bordeaux mixture, maneb, or zineb). The first application should be made just before bud break, the second application should be made two weeks after the first one, and the third application when leaves are one-half expanded. A late fall spray is said to greatly increase control of anthracnose.

* * * * * *

Conclusion

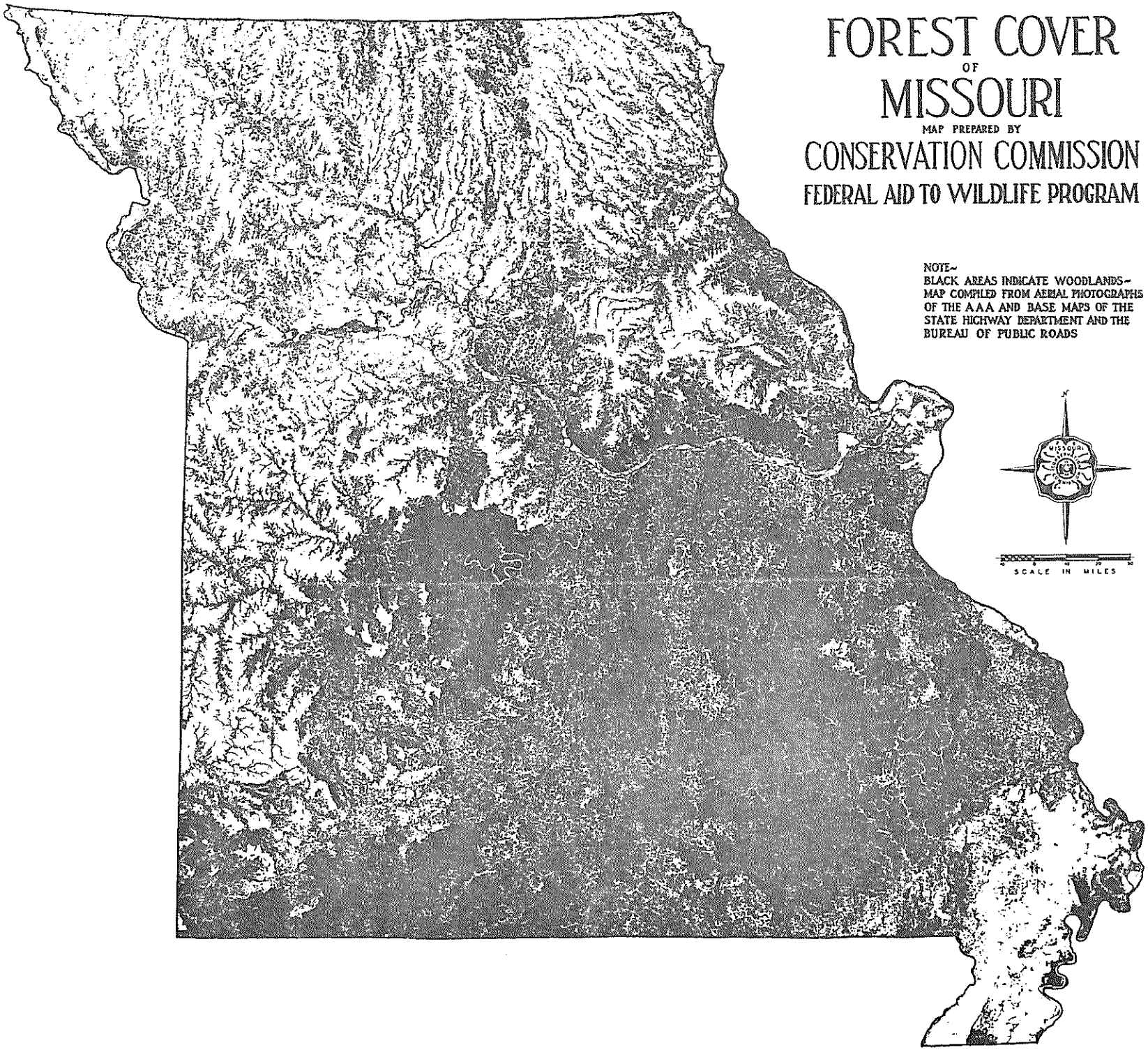
Summer drought, pine wilt nematode, the looper complex, Rhizosphaera needlecast and Diplodia were the most obvious problems during 1980.

In order to recharge ground water supplies, a substantial amount of precipitation will be required this winter and spring, 1981. Dormant shrubs and trees do require moisture in the soil for their existance through the winter period.

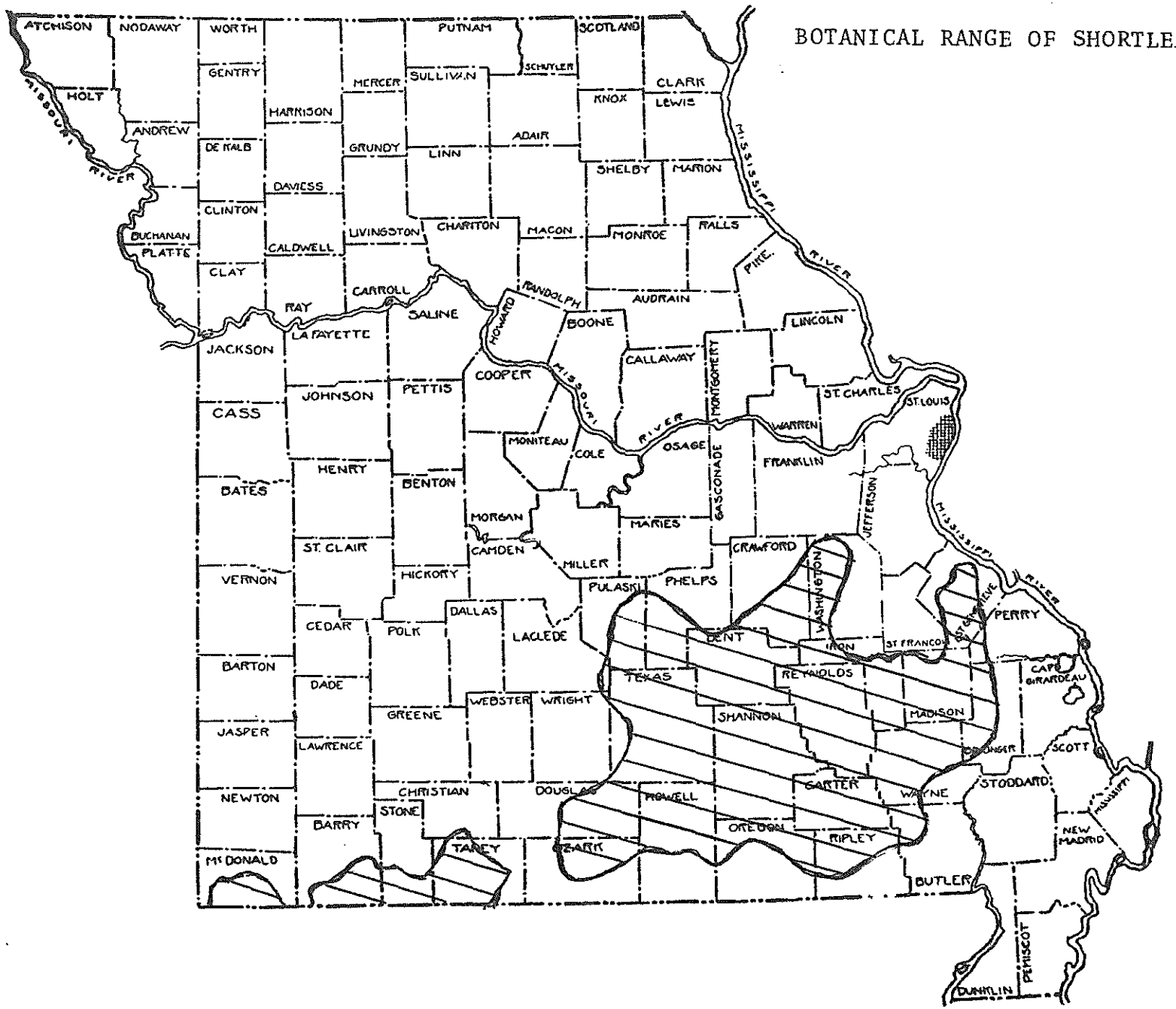
We were busy in 1980 informing people of pest conditions and of the potential devastating effects of the gypsy moth. We contacted people in person as well as through radio.

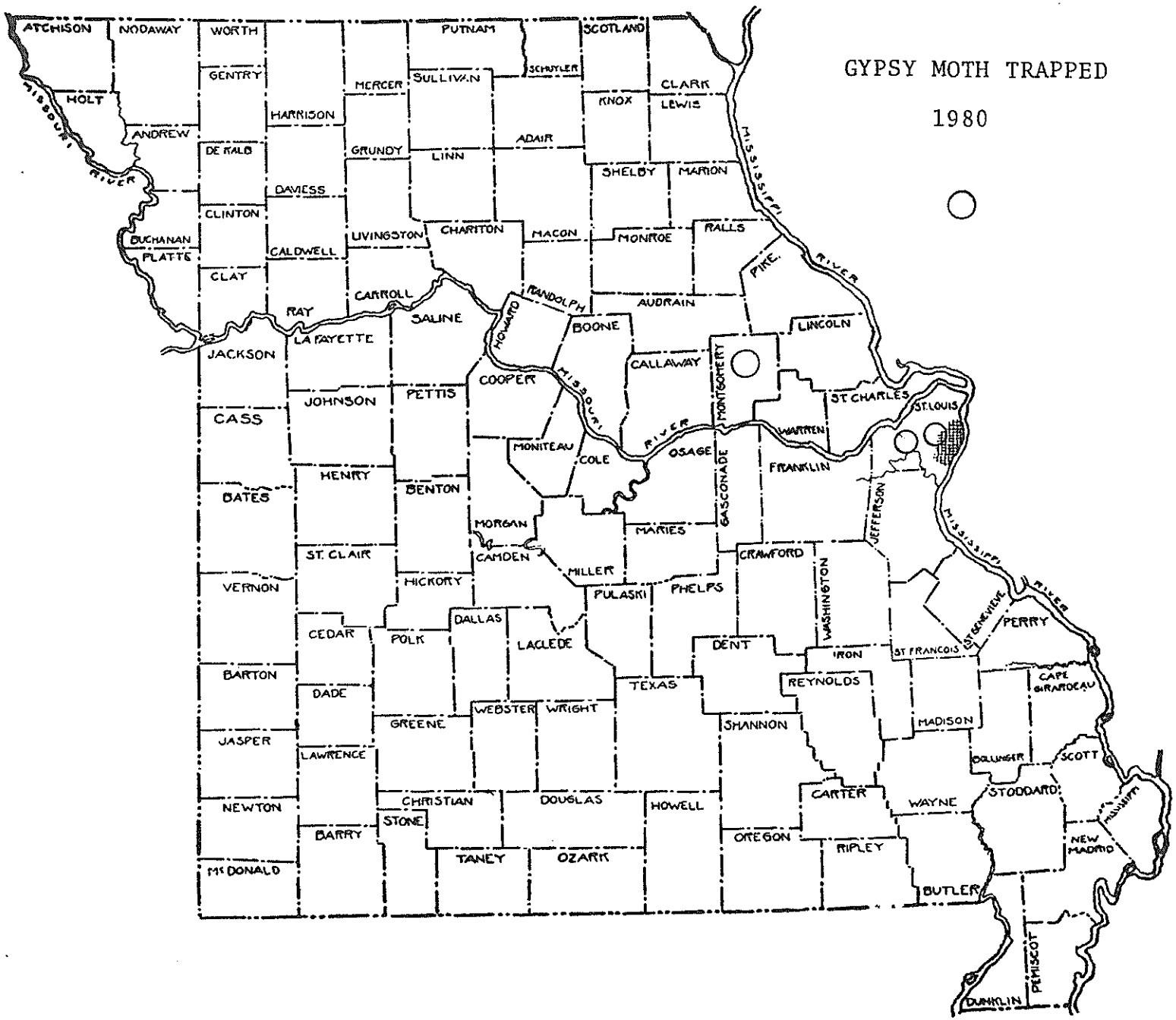
As always, the most significant and personally rewarding of all activities was working with people, providing service to all who sought answers to their pest problems. We always appreciate the assistance of those foresters who submitted reports and observations about pests and those who kept a watchful eye on the forests on their districts.

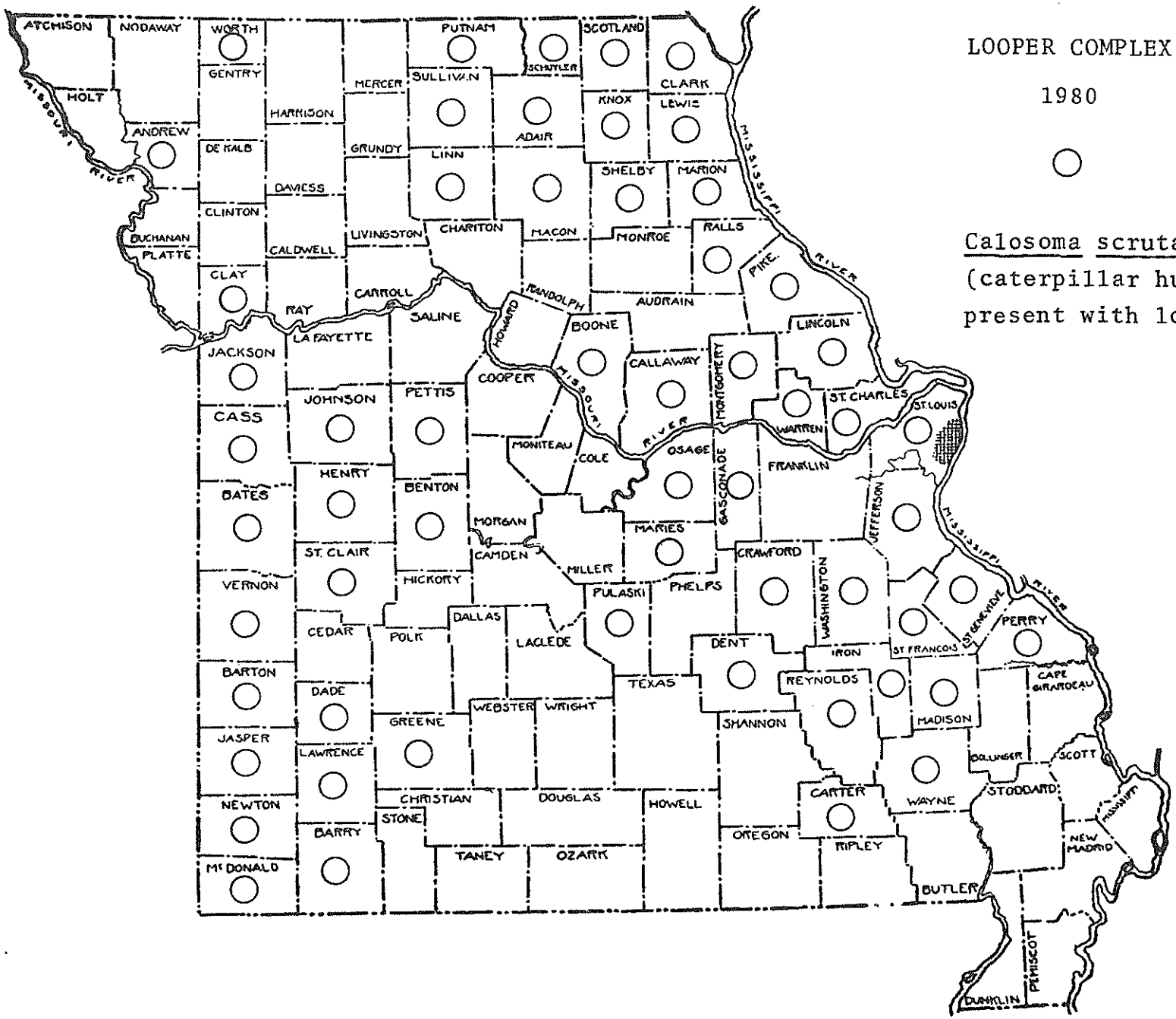
Such cooperation makes for a successful Forest Insect and Disease Management Program.


FOREST COVER
OF
MISSOURI
MAP PREPARED BY
CONSERVATION COMMISSION
FEDERAL AID TO WILDLIFE PROGRAM
NOTE~
BLACK AREAS INDICATE WOODLANDS~
MAP COMPILED FROM AERIAL PHOTOGRAPHS
OF THE AAA AND BASE MAPS OF THE
STATE HIGHWAY DEPARTMENT AND THE
BUREAU OF PUBLIC ROADS
SCALE IN MILES

BOTANICAL RANGE OF SHORTLEAF PINE




GYPSY MOTH TRAPPED
1980
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
SCHUYLER
CLARK
KNOX
LEWIS
HOLT
GENTRY
MERCER
SULLIVAN
HARRISON
ANDREW
DE KALB
GRUNDY
LINN
ADAIR
SHELBY
MARION
DAVIESS
CLINTON
BUCHANAN
PLATTE
CALDWELL
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
CLAY
CARROLL
RANDOLPH
AUDRAIN
PIKE
RAY
SALINE
HOWARD
BOONE
LINCOLN
JACKSON
LAFAYETTE
CALLAWAY
MONTGOMERY
COOPER
JOHNSON
PETTIS
ST CHARLES
ST LOUIS
CASS
MONITEAU
COLE
OSAGE
WARREN
FRANKLIN
HENRY
BENTON
BATES
GASCONADE
JEFFERSON
MORGAN
MARIES
CAMDEN
ST CLAIR
CRAWFORD
MILLER
VERNON
HICKORY
PULASKI
PHELPS
WASHINGTON
DALLAS
CEDAR
POLK
LACLEDE
DENT
IRON
ST FRANCOIS
STE GENEVIEVE
PERRY
BARTON
TEXAS
REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
WRIGHT
GREENE
SHANNON
MADISON
JASPER
LAWRENCE
BOLLINGER
SCOTT
CARTER
WAYNE
STODDARD
CHRISTIAN
DOUGLAS
HOWELL
NEWTON
STONE
BARRY
OREGON
RIPLEY
NEW MADRID
TANEY
OZARK
McDONALD
BUTLER
PEMISCOT
DUNKLIN
MISSOURI RIVER
MISSISSIPPI RIVER



LOOPER COMPLEX

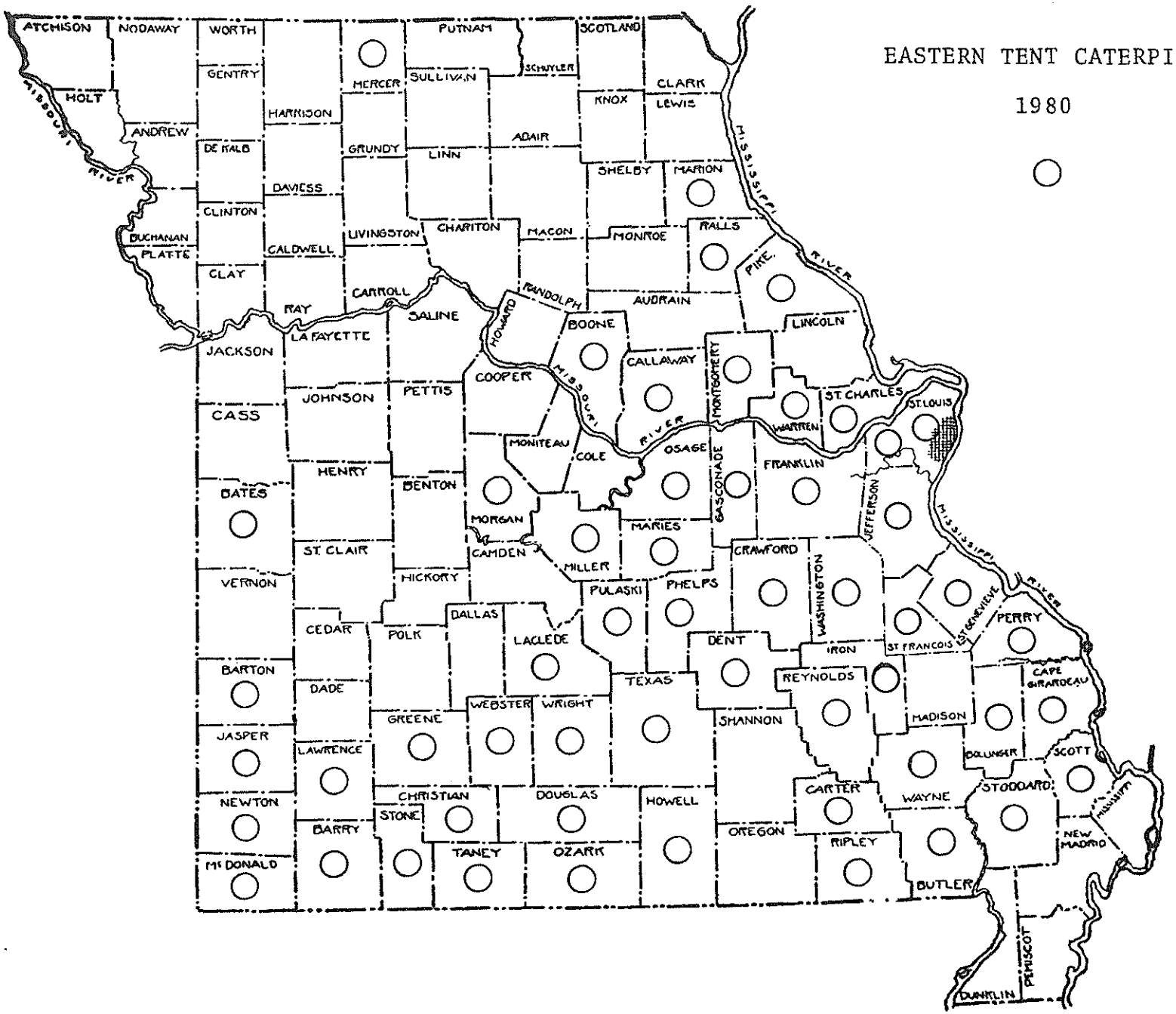
1980

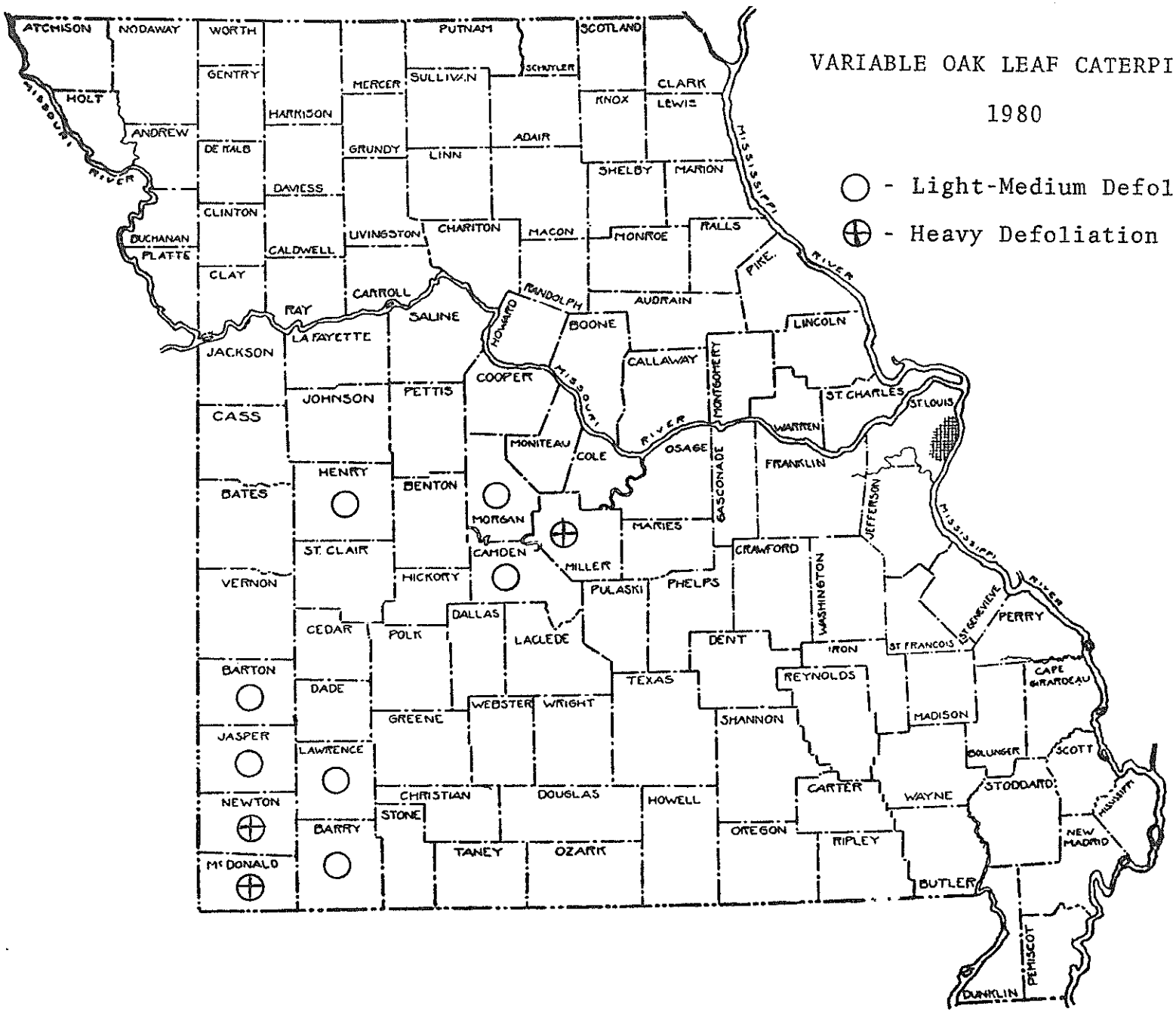
○

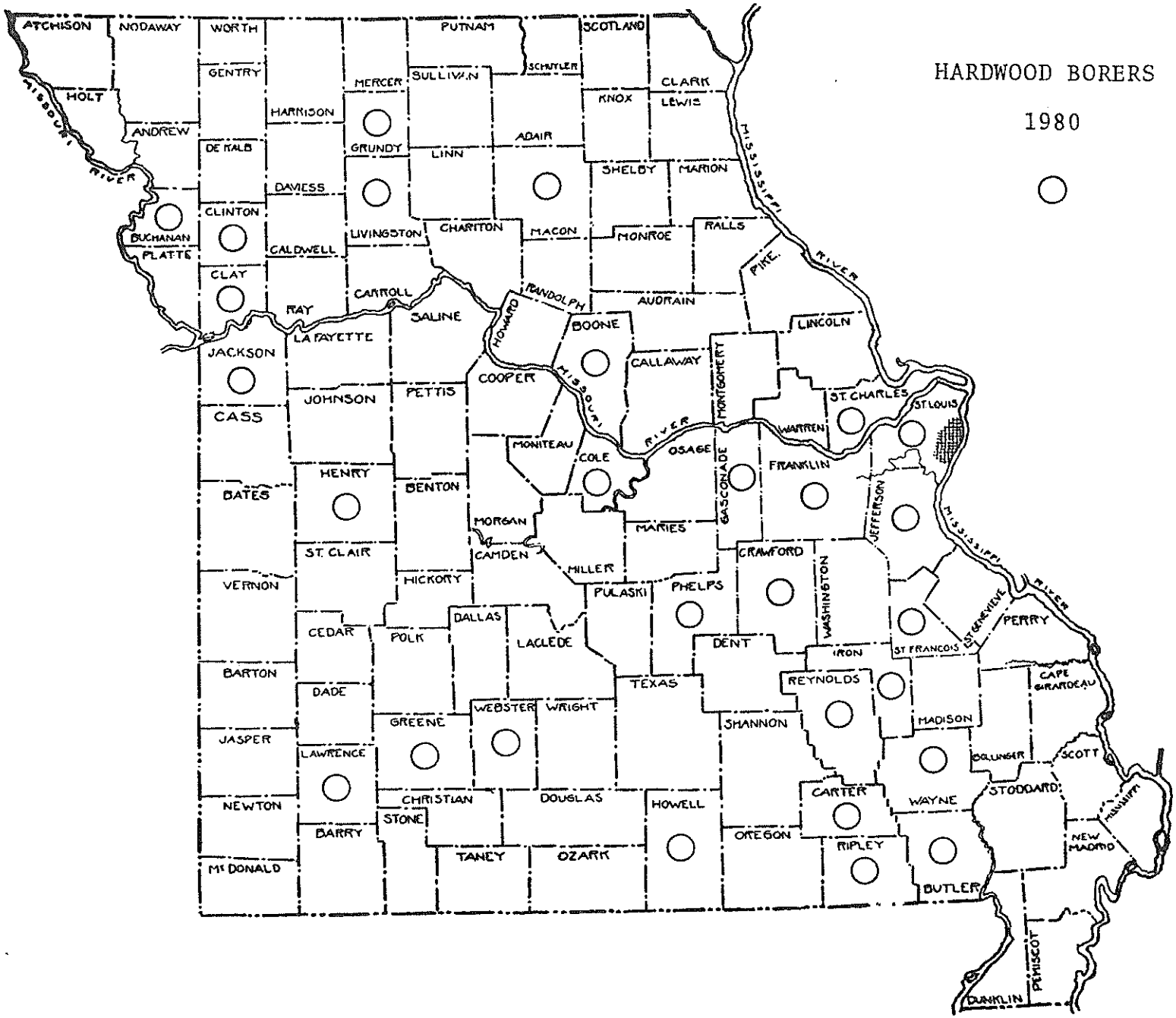
Calosoma scrutator
(caterpillar hunter)
present with loopers

EASTERN TENT CATERPILLAR

1980




VARIABLE OAK LEAF CATERPILLAR
1980
○ - Light-Medium Defoliation
⊕ - Heavy Defoliation
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
SCHUYLER
GENTRY
MERCER
SULLIVAN
CLARK
KNOX
LEWIS
HOLT
HARRISON
ANDREW
GRUNDY
LINN
ADAIR
DE KALB
SHELBY
MARION
DAVIESS
CLINTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
PLATTE
CALDWELL
LIVINGSTON
CLAY
CARROLL
RANDOLPH
PIKE
RAY
SALINE
AUDRAIN
HOWARD
BOONE
LINCOLN
LAFAYETTE
JACKSON
COOPER
CALLAWAY
MONTGOMERY
JOHNSON
PETTIS
ST. CHARLES
ST. LOUIS
CASS
MONITEAU
COLE
OSAGE
WARREN
FRANKLIN
HENRY
BENTON
BATES
MORGAN
GASCONADE
MARIES
JEFFERSON
ST. CLAIR
CAMDEN
MILLER
CRAWFORD
VERNON
HICKORY
PULASKI
PHELPS
WASHINGTON
PERRY
DALLAS
CEDAR
POLK
LACLEDE
DENT
IRON
ST. FRANCOIS
STE. GENEVIEVE
BARTON
DADE
TEXAS
REYNOLDS
CAPE GIRARDEAU
GREENE
WEBSTER
WRIGHT
SHANNON
MADISON
JASPER
LAWRENCE
BOLLINGER
SCOTT
CARTER
WAYNE
STODDARD
CHRISTIAN
DOUGLAS
HOWELL
NEWTON
STONE
OREGON
NEW MADRID
BARRY
TANEY
OZARK
RIPLEY
McDONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


HARDWOOD BORERS
1980
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
GRUNDY
ADAIR
LINN
DE KALB
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
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CARROLL
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AUDRAIN
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MONITEAU
COLE
OSAGE
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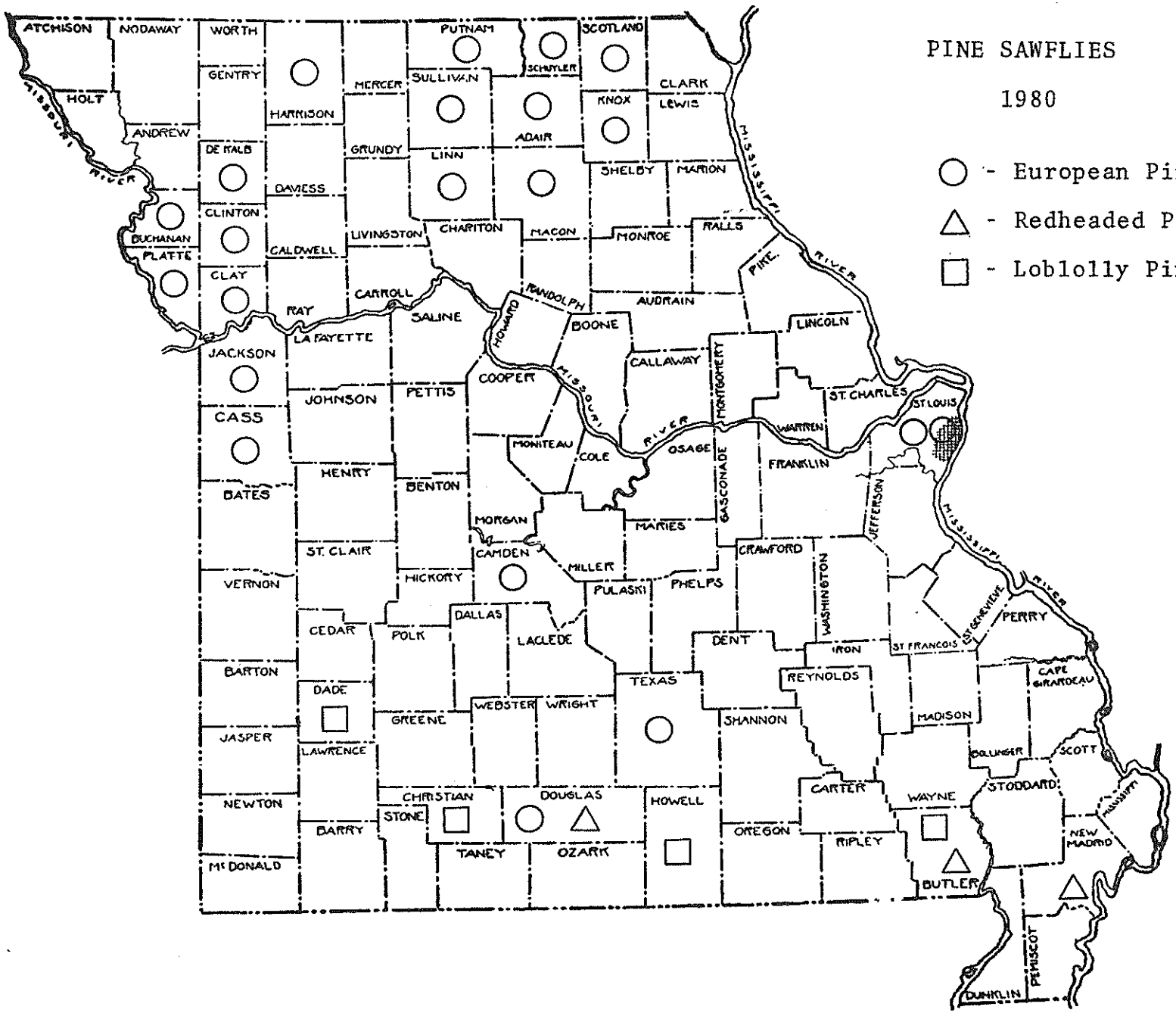
MISSOURI
RIVER


PINE SAWFLIES
1980
○ - European Pine Sawfly
△ - Redheaded Pine Sawfly
□ - Loblolly Pine Sawfly
ATCHISON
NODAWAY
WORTH
PUTNAM
SCHUYLER
SCOTLAND
CLARK
KNOX
LEWIS
HOLT
GENTRY
HARRISON
MERCER
SULLIVAN
ADAIR
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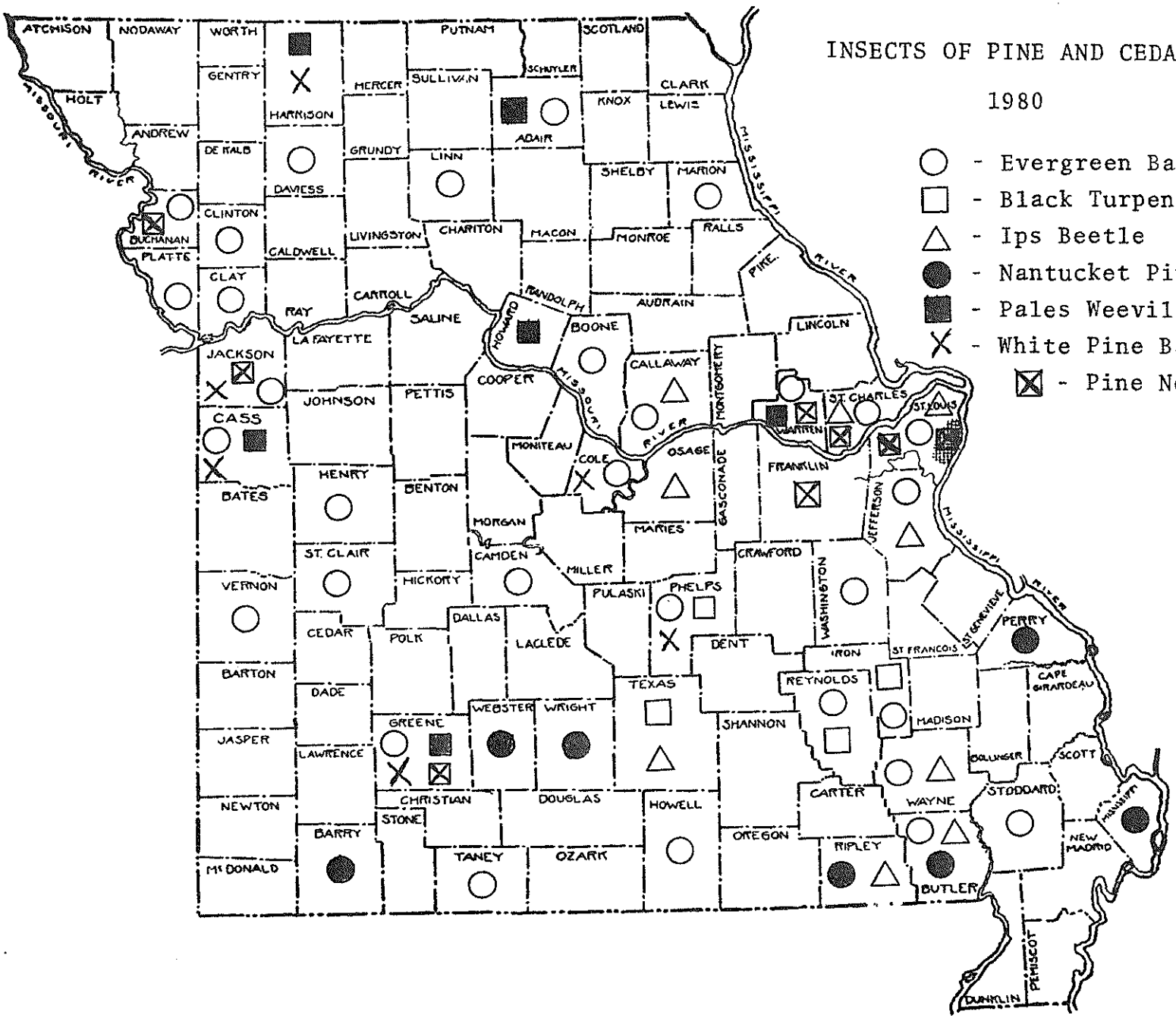
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


INSECTS OF PINE AND CEDAR
1980
○ - Evergreen Bagworm
□ - Black Turpentine Beetl
△ - Ips Beetle
● - Nantucket Pine Tip Mot
■ - Pales Weevil
X - White Pine Bark Aphid
⊠ - Pine Needle Scal
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
MERCER
SULLIVAN
SCHUYLER
CLARK
HOLT
HARRISON
KNOX
LEWIS
ANDREW
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AUDRAIN
PIKE
RIVER
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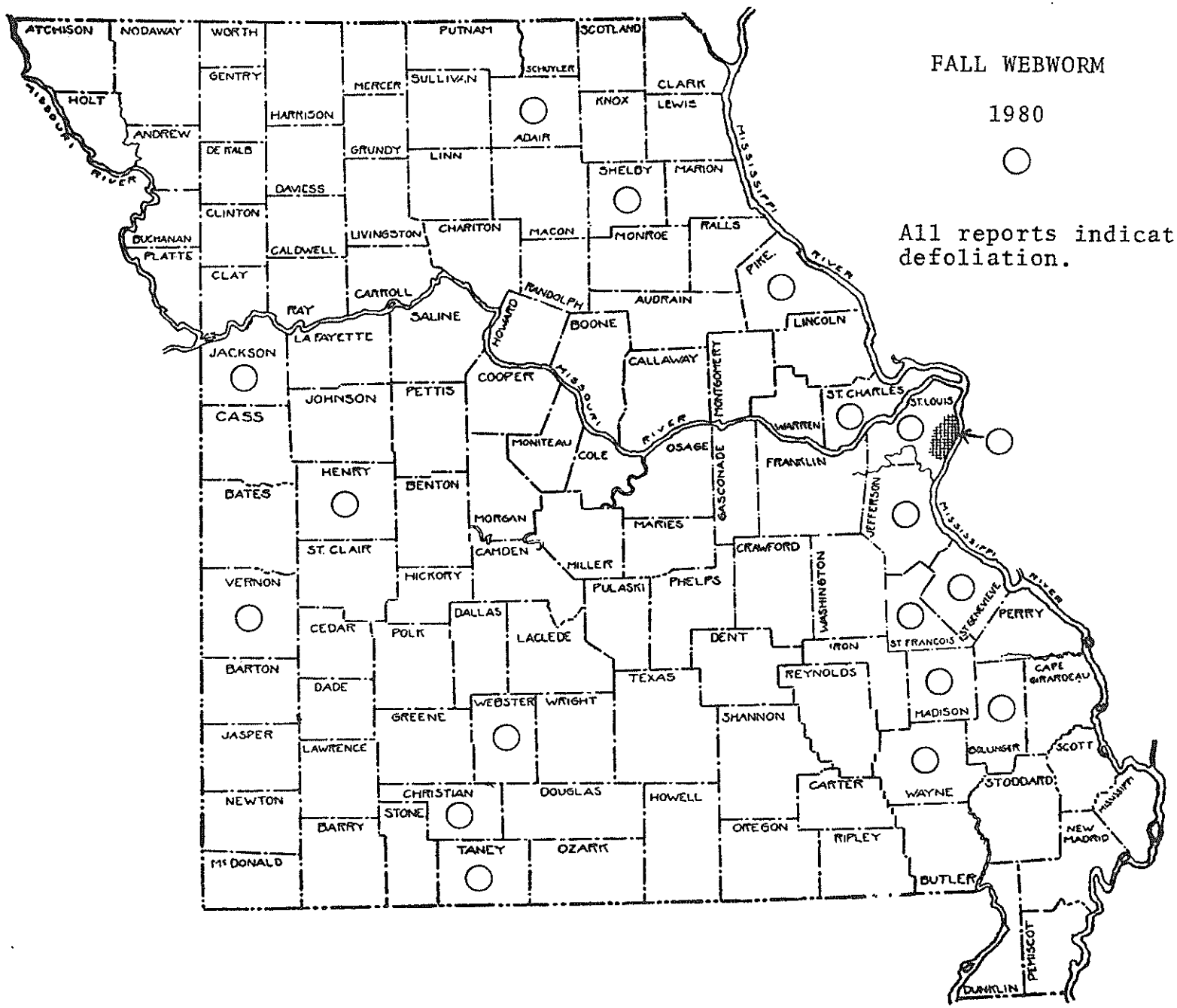
PEMISCOT

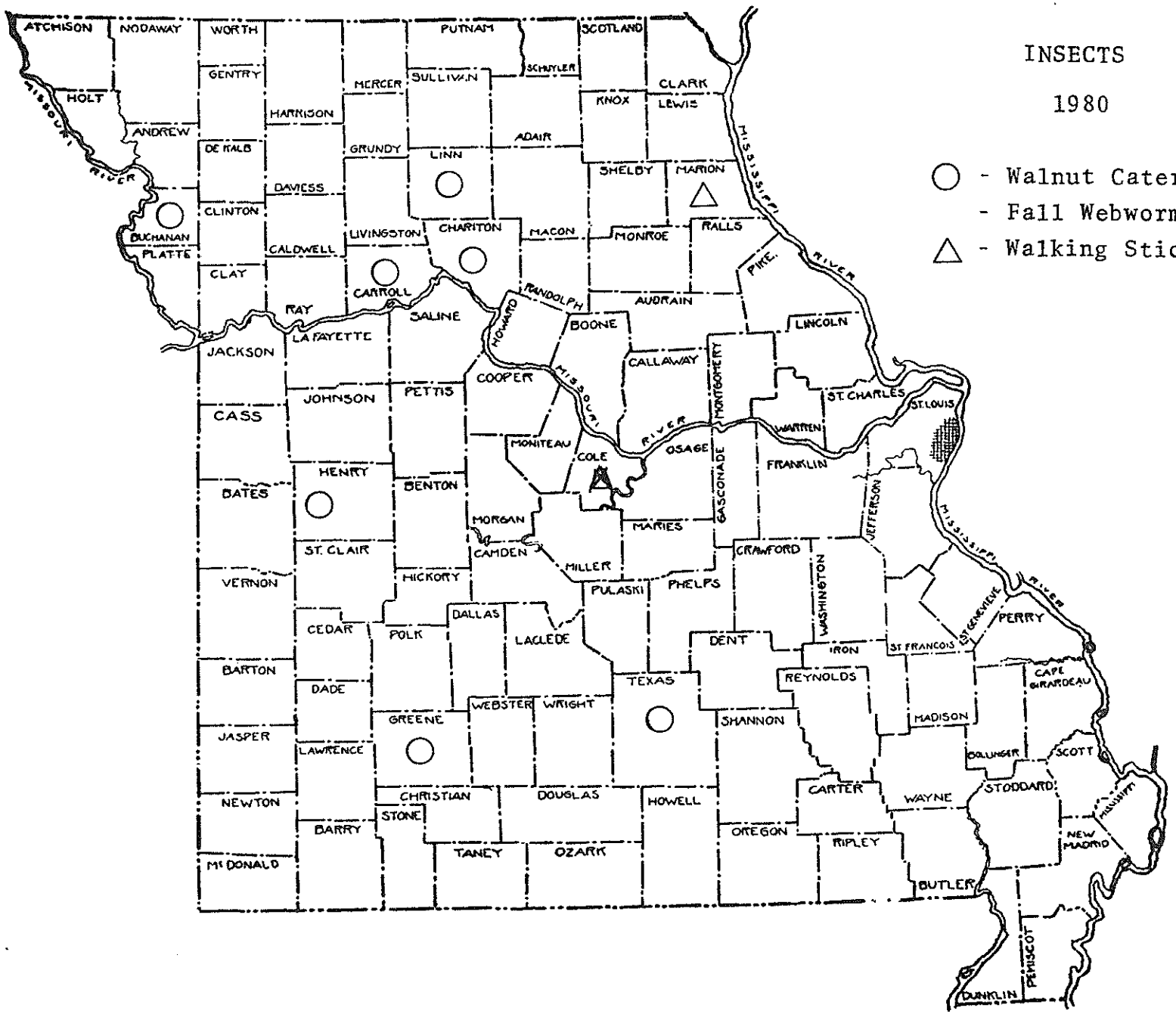


FALL WEBWORM

1980

○

All reports indicate light defoliation.


INSECTS
1980
○ - Walnut Caterpillar
- Fall Webworm
△ - Walking Stick
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
CLARK
GENTRY
SCHUYLER
KNOX
LEWIS
HOLT
MERCER
SULLIVAN
HARRISON
ANDREW
GRUNDY
ADAIR
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SHELBY
MARION
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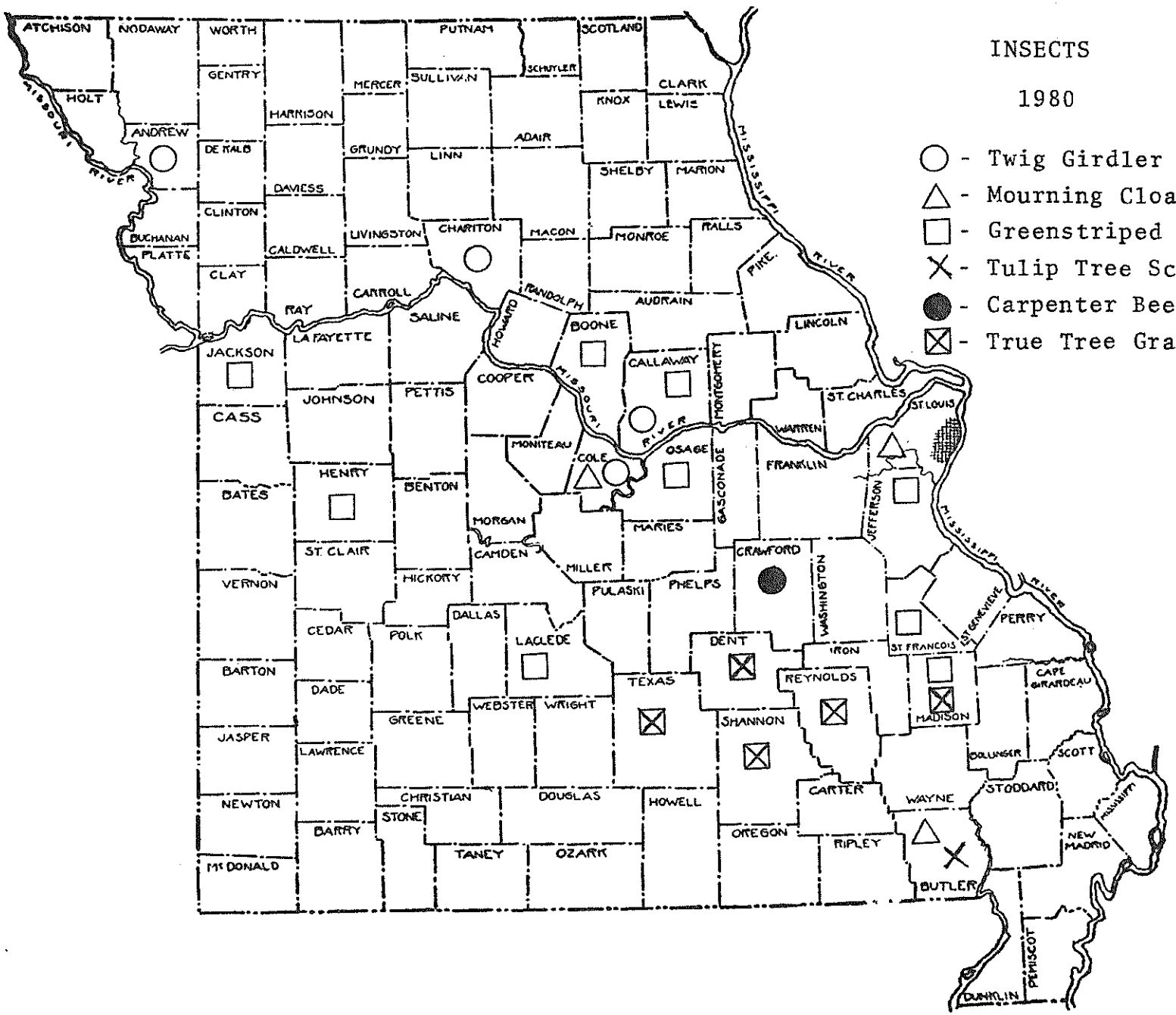
McDONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


INSECTS
1980
○ - Twig Girdler
△ - Mourning Cloak Butterfly
□ - Greenstriped fruitworm
X - Tulip Tree Scale
● - Carpenter Bee
⊠ - True Tree Grasshopper
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
ADAIR
DE KALB
GRUNDY
LINN
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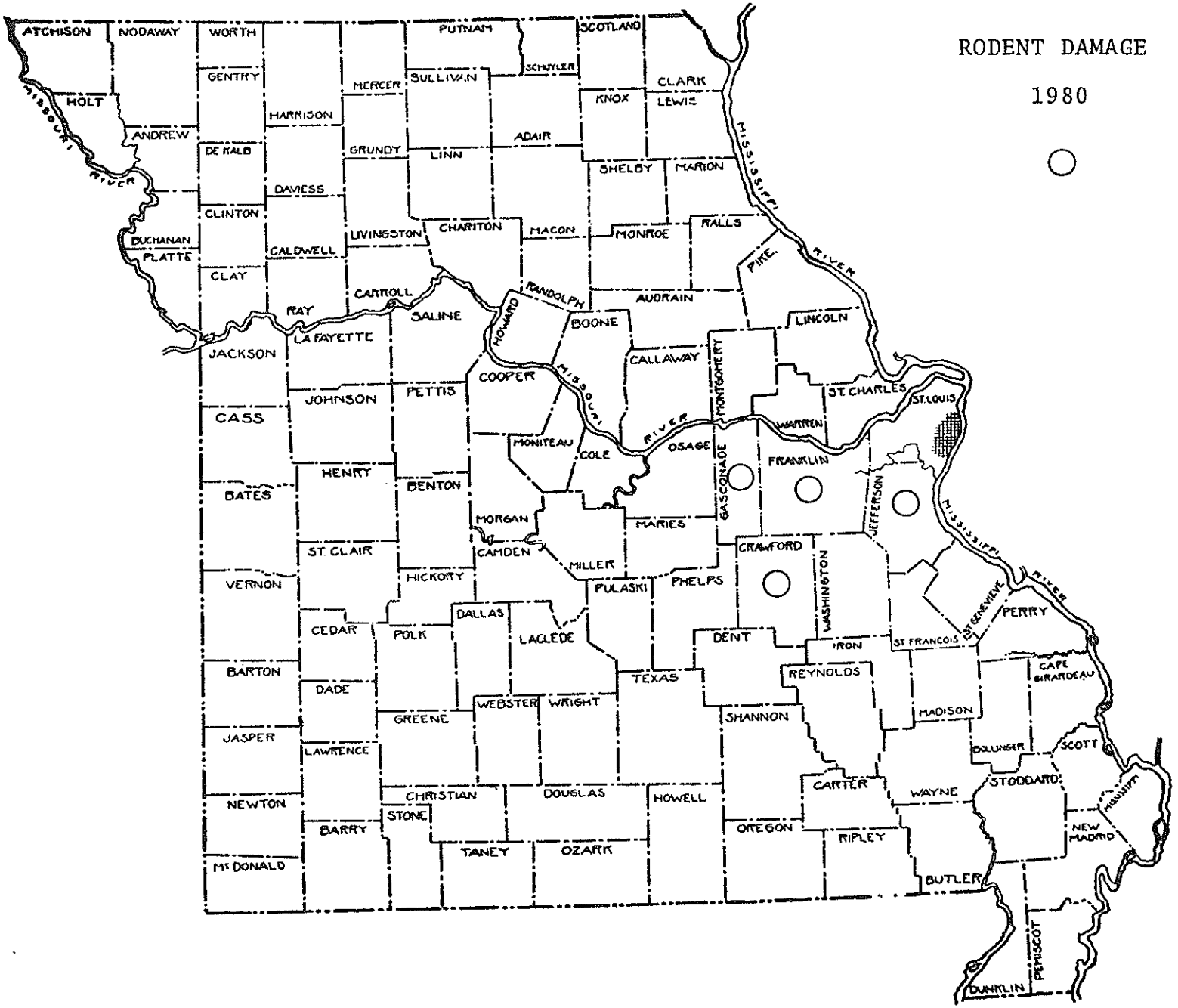
MISSOURI RIVER
MISSISSIPPI RIVER


RODENT DAMAGE
1980
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
SCHUYLER
CLARK
KNOX
LEWIS
GENTRY
MERCER
SULLIVAN
HOLT
HARRISON
ADAIR
ANDREW
DE KALB
GRUNDY
LINN
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
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PIKE
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SALINE
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BOONE
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LAFAYETTE
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CALLAWAY
MONTGOMERY
ST. CHARLES
ST. LOUIS
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LACLEDE
DENT
IRON
ST. FRANCOIS
STE. GENEVIEVE
BARTON
DADE
TEXAS
REYNOLDS
CAPE GIRARDEAU
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HOWELL
CARTER
WAYNE
STODDARD
NEWTON
STONE
OREGON
RIPLEY
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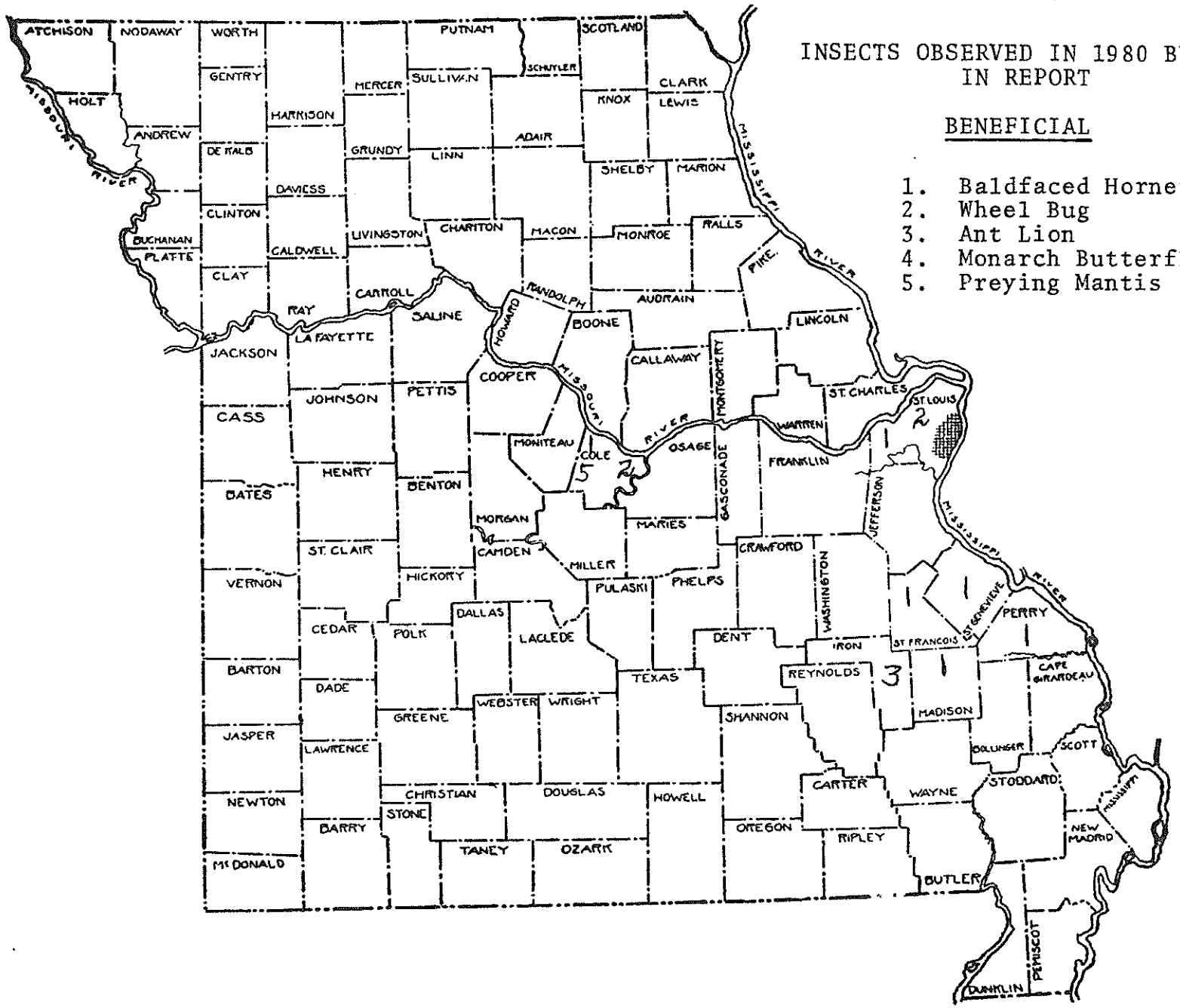
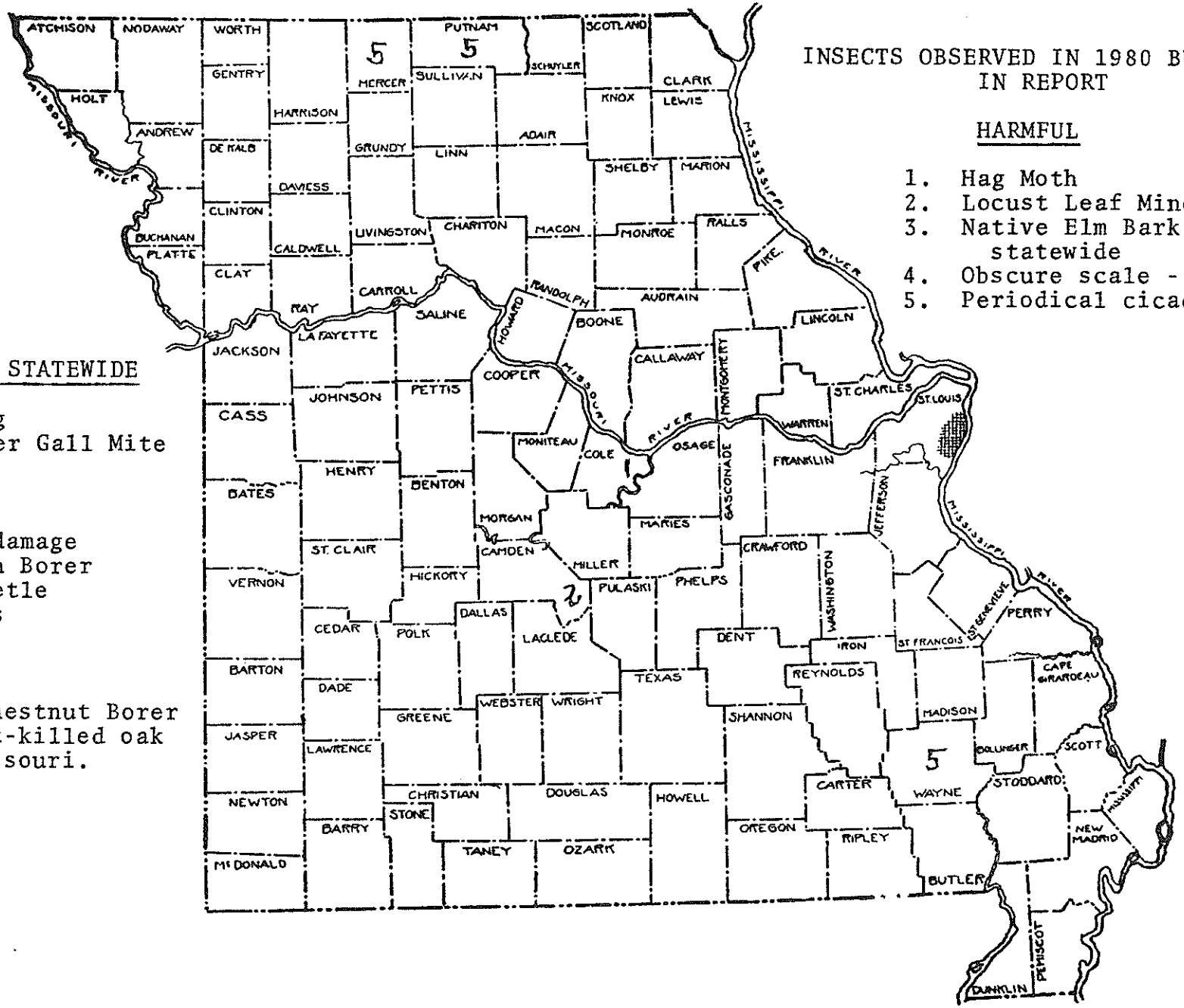
BARRY
TANEY
OZARK
Mc DONALD
BUTLER
DUNKLIN
PEMISCOT
MISSISSIPPI
MISSOURI RIVER



INSECTS OBSERVED IN 1980 BUT NOT IN REPORT

BENEFICIAL

1. Baldfaced Hornet
2. Wheel Bug
3. Ant Lion
4. Monarch Butterfly-state
5. Preying Mantis



Two-Lined Chestnut Borer with drought-killed oak in south Missouri.

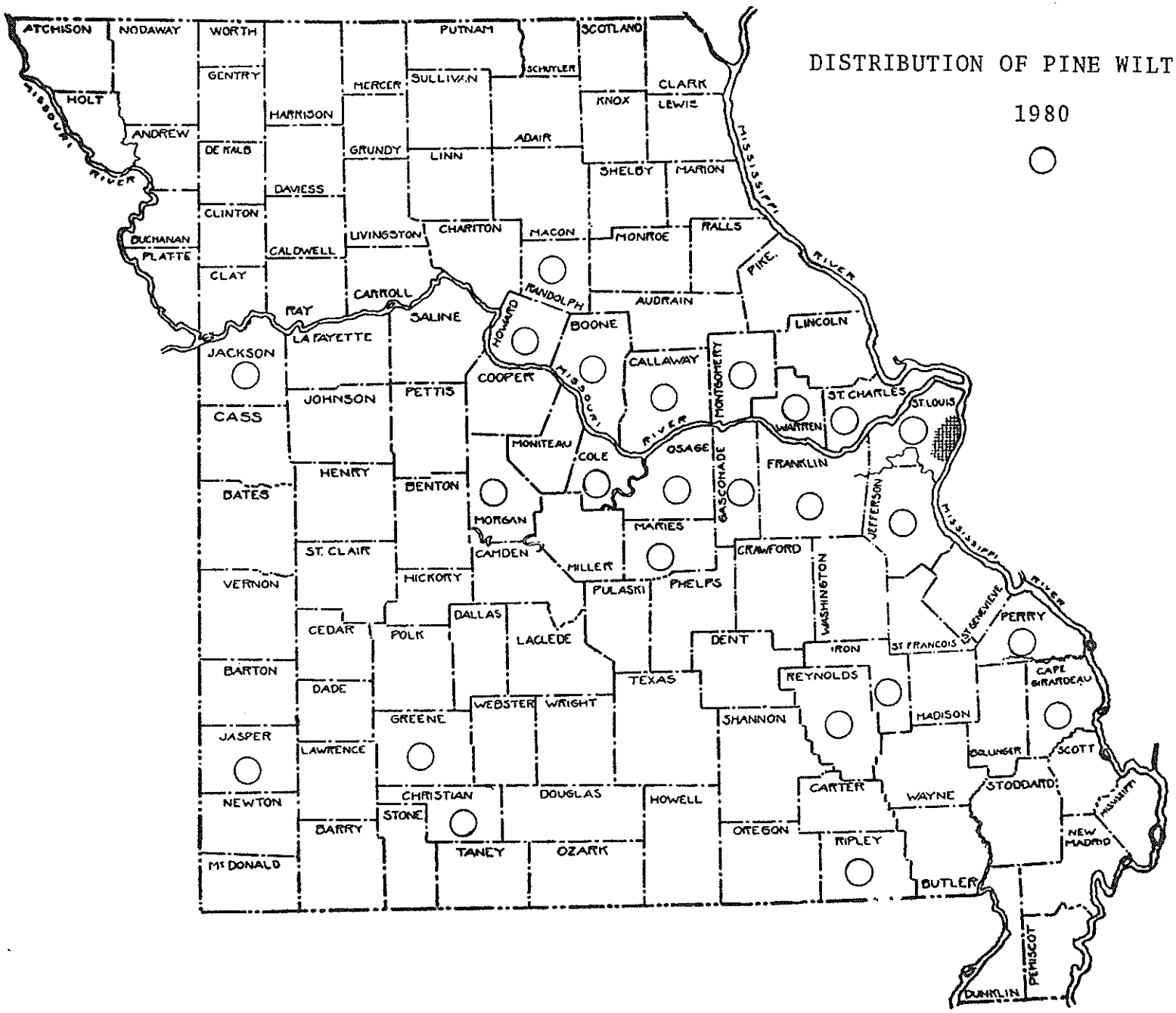
INSECTS - STATEWIDE

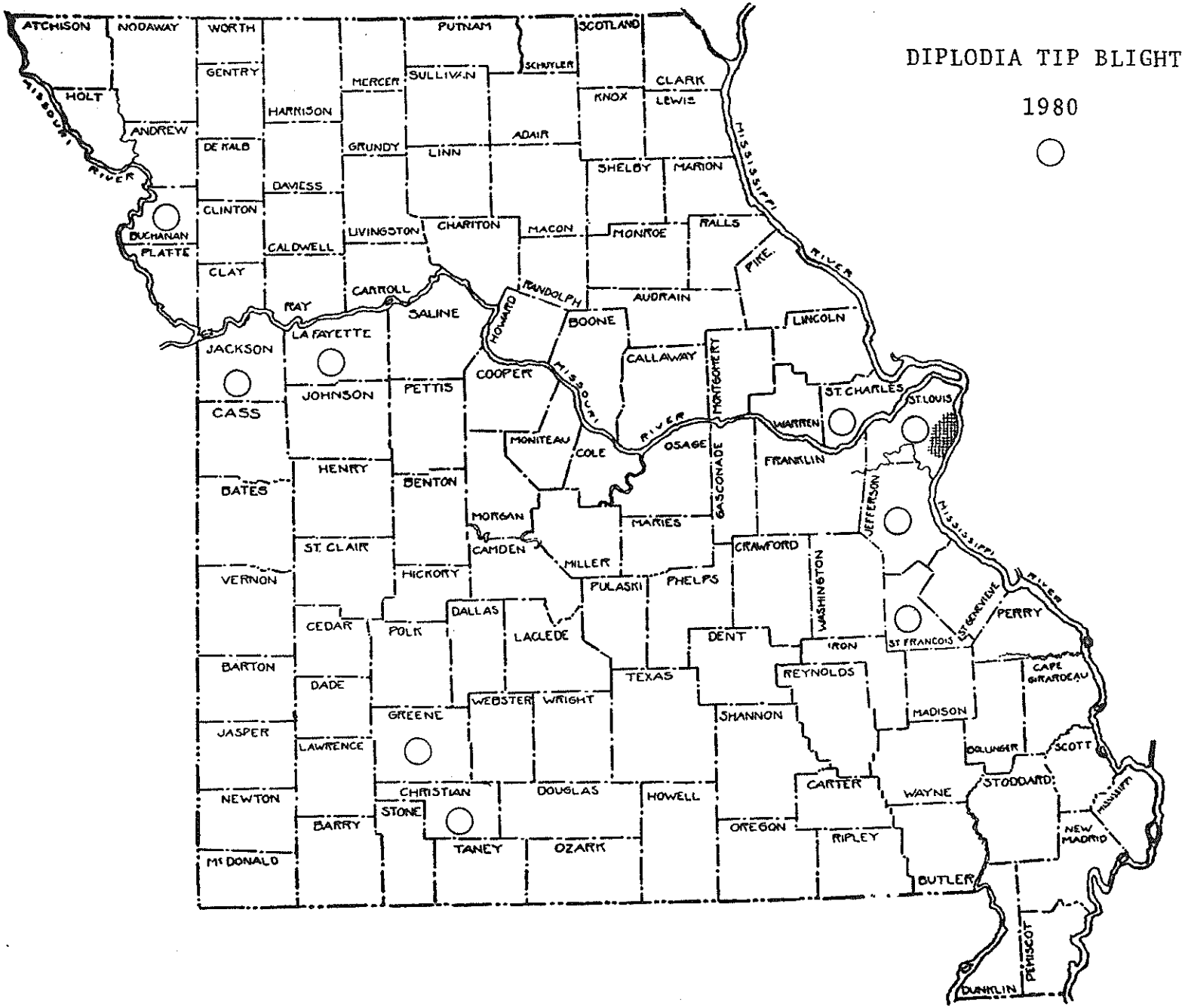
Boxelder Bug
Maple Bladder Gall Mite
Scorpions
Ticks
Spiders
Woodpecker damage
Bronze Birch Borer
Elm Leaf Beetle
Spider mites
Lace bugs

INSECTS OBSERVED IN 1980 BUT NOT IN REPORT

HARMFUL

1. Hag Moth
2. Locust Leaf Miner
3. Native Elm Bark Beetle - statewide
4. Obscure scale - statewide
5. Periodical cicada


DISTRIBUTION OF PINE WILT DISEASE
1980
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
SCHUYLER
CLARK
KNOX
LEWIS
GENTRY
MERCER
SULLIVAN
HOLT
HARRISON
ANDREW
DE KALB
GRUNDY
LINN
ADAIR
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
PLATTE
CALDWELL
CLAY
CARROLL
RANDOLPH
AUDRAIN
PIKE
RAY
SALINE
HOWARD
BOONE
LINCOLN
LAFAYETTE
JACKSON
COOPER
CALLAWAY
MONTGOMERY
WARREN
ST. CHARLES
ST. LOUIS
JOHNSON
PETTIS
CASS
MONITEAU
COLE
OSAGE
GASCONADE
FRANKLIN
JEFFERSON
HENRY
BENTON
BATES
MORGAN
MARIES
CAMDEN
MILLER
CRAWFORD
ST. CLAIR
PULASKI
PHELPS
WASHINGTON
HICKORY
VERNON
DALLAS
PERRY
STE GENEVIEVE
CEDAR
POLK
LACLEDE
DENT
IRON
ST FRANCOIS
BARTON
TEXAS
REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
WRIGHT
GREENE
SHANNON
MADISON
JASPER
LAWRENCE
BOLLINGER
SCOTT
CARTER
WAYNE
STODDARD
NEWTON
CHRISTIAN
DOUGLAS
HOWELL
BARRY
STONE
OREGON
NEW MADRID
RIPLEY
TANEY
OZARK
Mc DONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


DIPLODIA TIP BLIGHT
1980
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
SCHUYLER
CLARK
KNOX
LEWIS
GENTRY
MERCER
SULLIVAN
HOLT
HARRISON
ANDREW
DE KALB
GRUNDY
LINN
ADAIR
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
PLATTE
CALDWELL
CLAY
CARROLL
RANDOLPH
AUDRAIN
PIKE
RIVER
RAY
SALINE
HOWARD
BOONE
LINCOLN
JACKSON
LAFAYETTE
COOPER
CALLAWAY
MONTGOMERY
ST. CHARLES
ST. LOUIS
JOHNSON
PETTIS
CASS
MISSOURI
RIVER
MONITEAU
COLE
OSAGE
WARREN
FRANKLIN
HENRY
BENTON
BATES
GASCONADE
JEFFERSON
MORGAN
MARIES
CRAWFORD
ST. CLAIR
CAMDEN
MILLER
WASHINGTON
VERNON
HICKORY
PULASKI
PHELPS
MISSISSIPPI
RIVER
DALLAS
CEDAR
POLK
LACLEDE
DENT
IRON
ST. FRANCOIS
STE. GENEVIEVE
PERRY
BARTON
DADE
TEXAS
REYNOLDS
CAPE GIRARDEAU
WEBSTER
WRIGHT
GREENE
SHANNON
MADISON
JASPER
LAWRENCE
BOLLINGER
SCOTT
CHRISTIAN
DOUGLAS
HOWELL
CARTER
WAYNE
STODDARD
NEWTON
STONE
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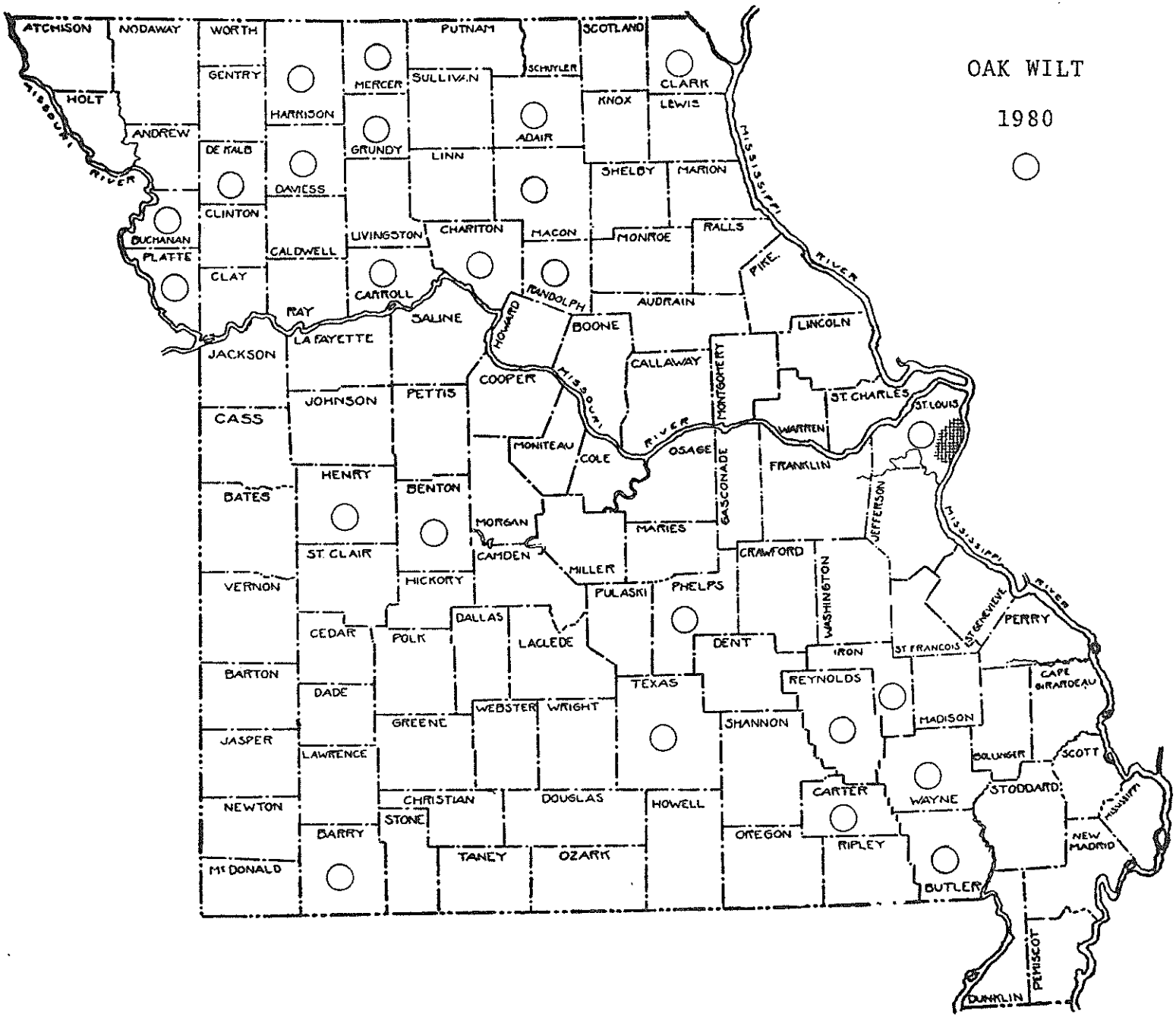
OREGON
RIPLEY
NEW MADRID
TANEY
OZARK
McDONALD
BUTLER
DUNKLIN
PEMISCOT


OAK WILT
1980
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
MERCER
SULLIVAN
SCHUYLER
CLARK
HOLT
HARRISON
KNOX
LEWIS
ANDREW
GRUNDY
ADAIR
LINN
DE KALB
DAVIESS
SHELBY
MARION
CLINTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
LIVINGSTON
CALDWELL
PLATTE
CLAY
CARROLL
RANDOLPH
AUDRAIN
PIKE
RAY
SALINE
HOWARD
BOONE
LINCOLN
JACKSON
LAFAYETTE
COOPER
CALLAWAY
MONTGOMERY
ST CHARLES
ST LOUIS
JOHNSON
PETTIS
WARREN
CASS
MONITEAU
COLE
OSAGE
FRANKLIN
HENRY
BENTON
GASCONADE
JEFFERSON
BATES
MORGAN
MARIES
CAMDEN
MILLER
CRAWFORD
ST CLAIR
PULASKI
PHELPS
WASHINGTON
VERNON
HICKORY
STE GENEVIEVE
PERRY
CEDAR
POLK
DALLAS
LACLEDE
DENT
IRON
ST FRANCOIS
BARTON
TEXAS
REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
WRIGHT
GREENE
SHANNON
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JASPER
LAWRENCE
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SCOTT
CARTER
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STODDARD
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CHRISTIAN
DOUGLAS
HOWELL
STONE
BARRY
OREGON
RIPLEY
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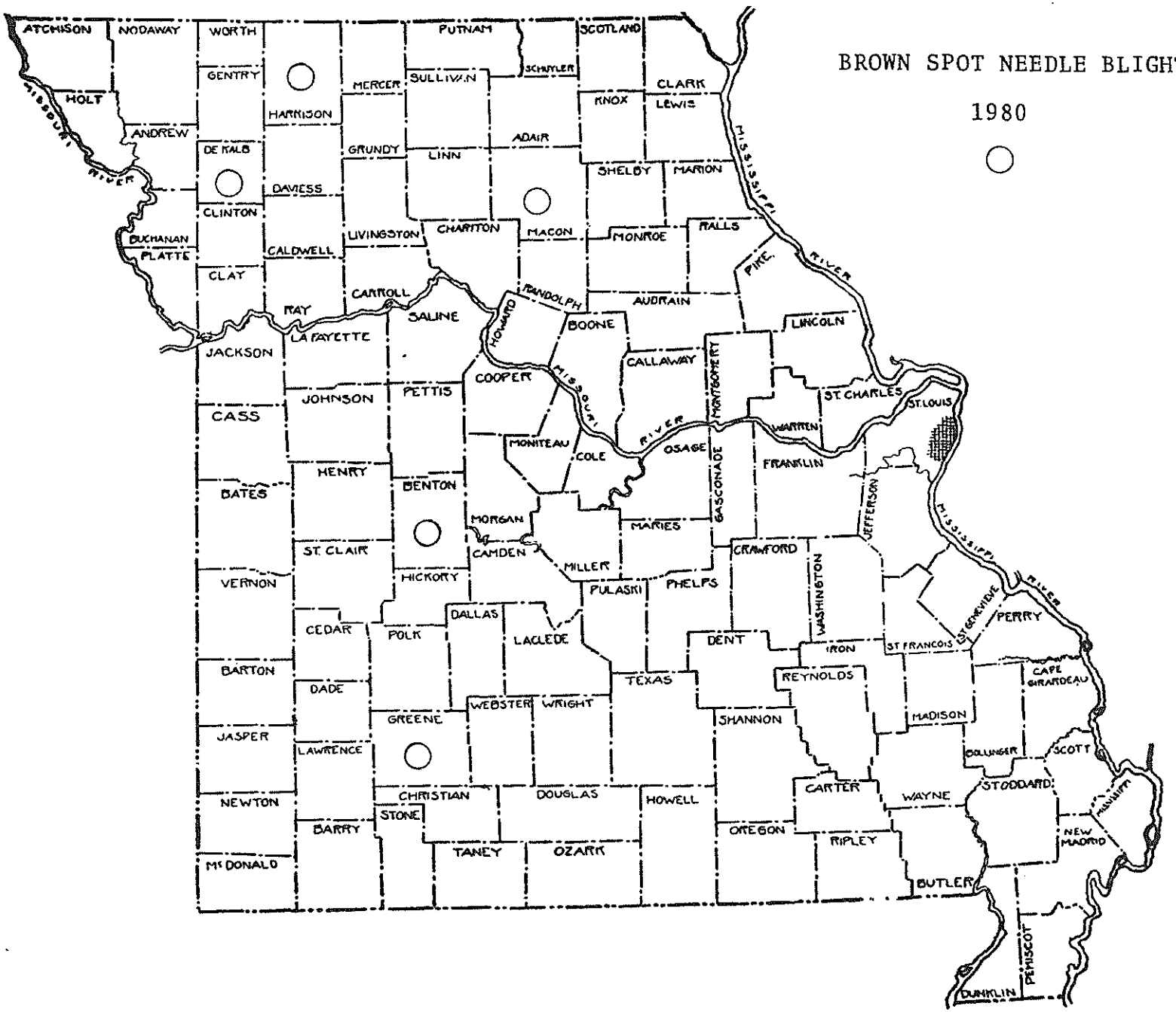
McDONALD
BUTLER
DUNKLIN
PEMISCOT
MISSOURI RIVER
MISSISSIPPI RIVER


BROWN SPOT NEEDLE BLIGHT
1980
ATCHISON
NODAWAY
WORTH
PUTNAM
SCOTLAND
GENTRY
SCHUYLER
CLARK
HOLT
MERCER
SULLIVAN
KNOX
LEWIS
HARRISON
ANDREW
ADAIR
GRUNDY
DE KALB
LINN
SHELBY
MARION
DAVIESS
CLINTON
LIVINGSTON
CHARITON
MACON
MONROE
RALLS
BUCHANAN
CALDWELL
PLATTE
CLAY
CARROLL
RANDOLPH
AUDRAIN
PIKE
RIVER
RAY
SALINE
HOWARD
BOONE
LINCOLN
JACKSON
LA FAYETTE
COOPER
CALLAWAY
MONTGOMERY
JOHNSON
PETTIS
ST CHARLES
ST LOUIS
CASS
MONITEAU
COLE
OSAGE
WARREN
FRANKLIN
HENRY
BENTON
BATES
MORGAN
MARIES
GASCONADE
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DALLAS
PERRY
CEDAR
POLK
LACLEDE
DENT
IRON
ST FRANCOIS
STGENEVIEVE
BARTON
TEXAS
REYNOLDS
CAPE GIRARDEAU
DADE
WEBSTER
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SHANNON
MADISON
GREENE
JASPER
LAWRENCE
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SCOTT
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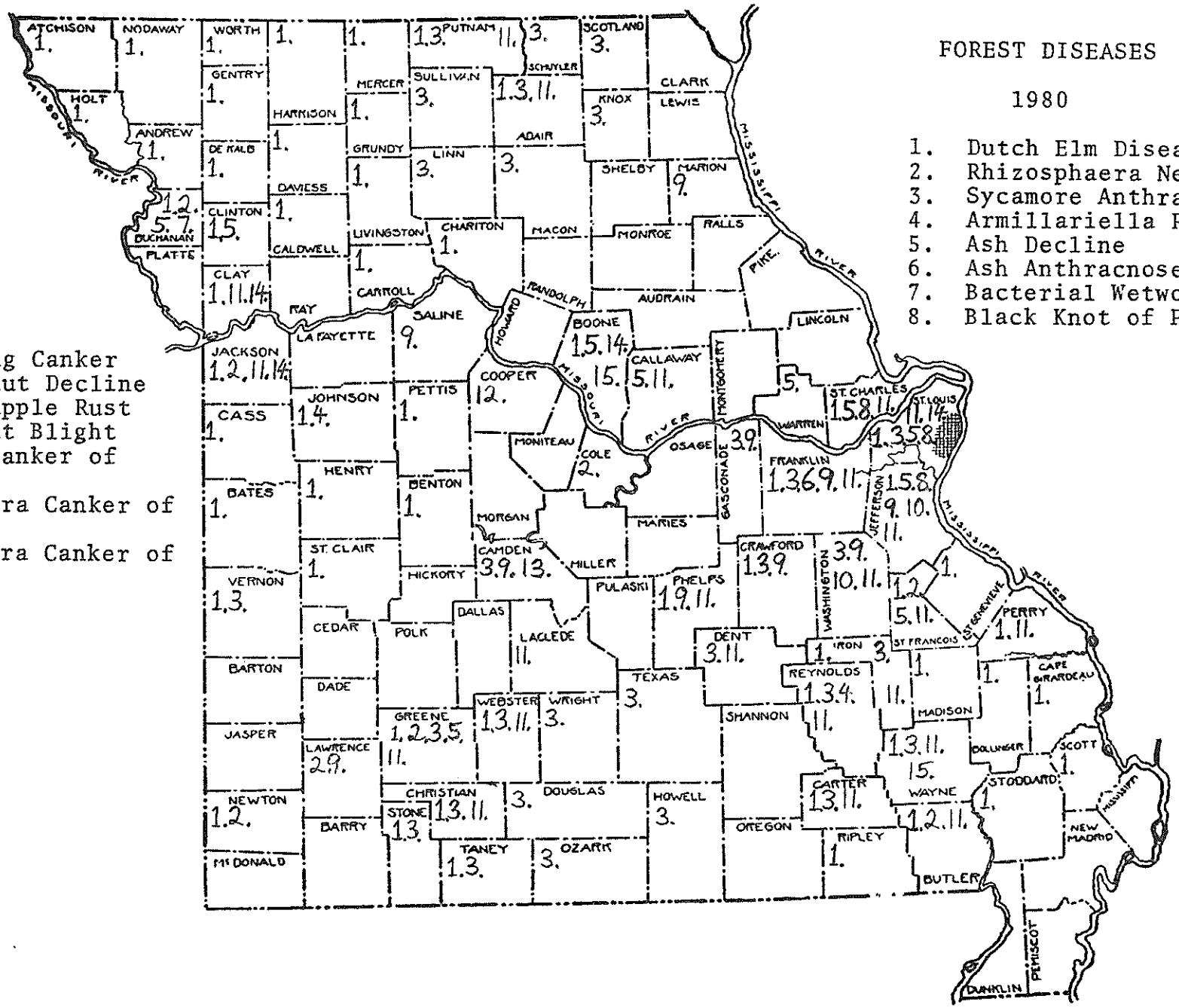
NEW MADRID
BARRY
RIPLEY
TANEY
OZARK
McDONALD
BUTLER
DUNKLIN
PEMISCOT

FOREST DISEASES

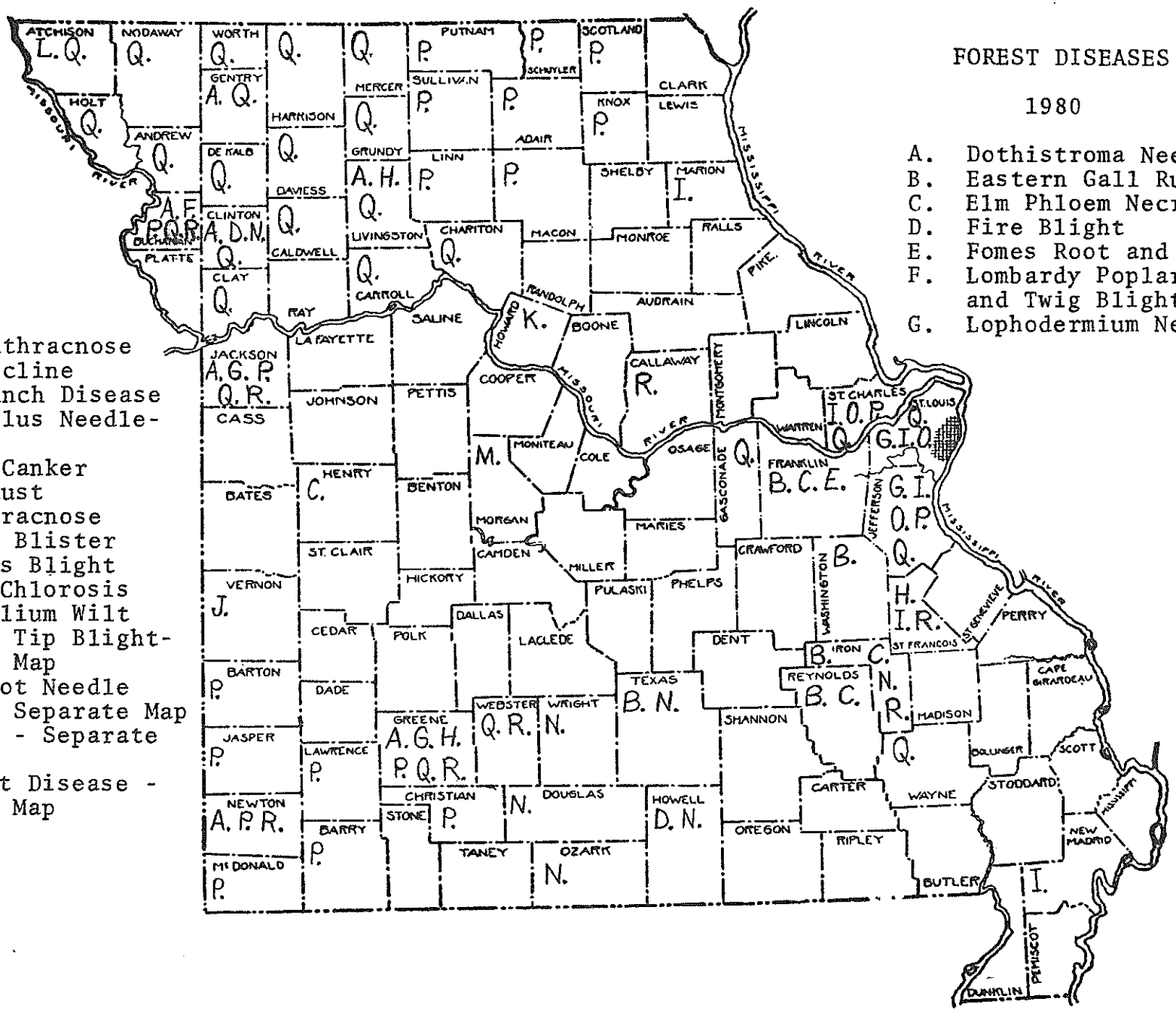
1980

1. Dutch Elm Disease
2. Rhizosphaera Needlecast
3. Sycamore Anthracnose
4. Armillariella Root Rot
5. Ash Decline
6. Ash Anthracnose
7. Bacterial Wetwood
8. Black Knot of Plum
9. Bleeding Canker
10. Butternut Decline
11. Cedar-Apple Rust
12. Chestnut Blight
13. Crown Canker of Dogwood
14. Cytospora Canker of Spruce
15. Cytospora Canker of Willow



FOREST DISEASES

1980



A. Dothistroma Needle Bligh
B. Eastern Gall Rust
C. Elm Phloem Necrosis
D. Fire Blight
E. Fomes Root and Butt Rot
F. Lombardy Poplar Leaf and Twig Blight
G. Lophodermium Needlecast
H. Maple Anthracnose
I. Maple Decline
J. Pecan Bunch Disease
K. Naemacyclus Needle-cast
L. Nectria Canker
M. Needle Rust
N. Oak Anthracnose
O. Oak Leaf Blister
P. Phomopsis Blight
Q. Pin Oak Chlorosis
R. Verticillium Wilt
S. Diplodia Tip Blight - Separate Map
T. Brown Spot Needle Blight - Separate Map
U. Oak Wilt - Separate Map
V. Pine Wilt Disease - Separate Map